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REPORT

OF THE

COMMITTEE APPOINTED TO EXAMINE AND REPORT

THE

Causes of Railroad Accidents,

THE

MEANS OF PREVENTING THEIR RECURRENCE, &c.

H. E. BARTLETT, SENATE, N. Y. STATE

New York -

Transmitted to the Legislature January 14, 1853.

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Hon. Charles Sumner, U.S.S. of Boston.

State of New-York.

No. 13.

IN SENATE, JAN. 14, 1853.

REPORT

Of the committee appointed to examine and report the causes of railroad accidents, the means of preventing their recurrence, &c.

STATE ENGINEER'S OFFICE,
Albany, *Jan.* 10, 1853.

The select committee appointed by resolution of the Senate, on the 15th of April last, by which they are required to examine and report to the Legislature, at the commencement of its next session, the causes of railroad accidents in this State, the means of preventing their recurrence, and their opinion whether any, and, if so, what legislation is required on the subject, respectfully

REPORT:

That they have deemed it necessary, in order to comply fully with the requirements of the resolution, to examine, personally, the principal railroads in the State, as the best means of obtaining information from the various agents and officers of the companies, of making themselves acquainted with the characteristics, workings, and management of the roads, and as most likely to lead to suggestions calculated to prevent the recurrence of accidents.

They were aided in their examinations by the professional skill and experience of several gentlemen connected with the management of railroads in this State, and were also accompanied by Senators Smith and Monroe, of the standing committee on railroads in the Senate, who had been invited by the officers of several companies to examine their roads, with the committee.

The committee also addressed a series of interrogatories to the officers of the several railroads, which, together with the replies, will be found in the Appendix. (See A.)

The following companies have failed to reply to the interrogatories:—The Albany and Schenectady, Albany and West Stockbridge, Buffalo and Niagara Falls, Buffalo and Rochester, Hudson River, Long-Island, New-York and Erie, New-York and Harlem, New-York and New Haven. Rensselaer and Saratoga, Saratoga and Washington, Schenectady and Troy, Troy and Greenbush Buffalo and State Line, Chemung, Plattsburgh and Montreal, Rochester, Lockport and Niagara Falls, Saratoga and Schenectady.

The resolution enjoins upon your committee three distinct duties:

1st. To examine into the causes of railroad accidents.

2d. To state the means of preventing them; and

3d. To suggest the necessary legislation, if, in their opinion, any is required.

The general causes of railroad accidents are:

1st. Defective construction.

2d. Improper management.

3d. Impediments in the roadway.

Under the first head, are embraced defects in the construction of roadways; of superstructure, and of rolling stock.

Under the second head are included, the running of engines and trains of too great weight, and at too high a rate of speed for the grades, strength and capacity of the road; the employ ment of incompetent or improper agents and workmen; tl want of proper and vigilant supervision; an insufficient syste of signals, and want of due attention thereto; the failure of conductors to make their running time; the running of trains too closely following each other; the running of engines and cars too great a distance, without thorough inspection; an insufficiency of brake power, and insufficient examination and inspection of the condition of the superstructure and rolling stock.

Under the third head are included, slides from the cuttings; persons and domestic animals upon the track; cars, hand cars, gravel and wood trains, &c., left standing in improper situations; vehicles crossing the track; obstructions designedly placed upon the track.

I. DEFECTIVE CONSTRUCTION.

Many serious accidents arise from the practice which prevails of opening roads for public travel before the work upon them is completed, and also from the haste in which much of it is performed.

High embankments are built in a short space of time, and frequently during freezing weather, the subsidence of which disturbs the allignment of the track.

The ballasting is frequently omitted, or only partially done, before the trains commence running. The gravel trains are run up close to the time of the passenger trains, and must be switched off in haste by the common hands, who, having other duties to perform, do this one carelessly.

The work is frequently left incomplete after it has been once brought into use, until after some serious accident has occurred.

Culverts and bridges are frequently constructed of insufficient strength, or of an improper quality of materials, or are continued in use after they have become weakened by decay.

The great number of road crossings at the level of the grade of the railroads, are prolific causes of accidents.

The material used for ballast, is often such that the frost disturbs the level of the track, and the ballast in some cases is not filled up sufficiently to retain the ties in their position.

The cross-ties are frequently of a quality of wood which is insufficient to retain the spikes driven to secure the rails; and they are sometimes of insufficient size, and placed at intervals too distant to afford a suitable support to the weight brought upon the rails.

The iron rails are sometimes of an inferior quality of metal, and too light to support the weight and resist the shocks of the engines and cars.

When heavy trains are run over steep grades and sharp curves, at high speed, the superstructure is required to be stronger than when less objectionable grades and curves occur.

The momentum with which the wheels strike the exterior rails in passing curves, must be resisted by the strength of the iron rails; by the tenacity of the spike in the wooden cross-sills; by the adhesion and weight of the ballasting, and by the strength of the chair at the joints.

If these are insufficient to resist the blow, the roadway is disturbed, or the train is thrown off the track.

High speed, on heavy descending grades, places the train out of the control of the engine and brakes, so that if unexpected impediments are discovered on the track, or if the machinery becomes deranged, it is almost impossible to avoid an accident.

When the rails are wet or frosty, this danger is increased. Engines of greater weight are required to ascend such grades, especially where freight has to be transported, in which case, engines of enormous size are sometimes used.

The effect of such engines on the superstructure, was graphically described by one of the engineers of a road where they were used, by saying "that they rooted up the track."

There are still in use many portions of road constructed at time when the usual weight of locomotives and trains was muc less than at present, and when the urgent demand of the trave ing community for a high rate of speed did not so much influen the management of Railroad companies.

If the present heavy trains and high rates of speed are to be maintained, it is imperative, for the safety of the public, that the superstructure on many portions of roads now in use, should be increased in strength.

Our passenger cars, as at present constructed, are in many respects eminently calculated to protect passengers from personal injury, in case of serious accident, and to this may be attributed the small loss of life that has, in many instances, attended frightful collisions and derailment of trains on high and precipitous embankments. In case of accidents occurring from the failure of axles, the thin flooring is no protection against the fractured axle forcing its way into the body of the car.

Much discussion has been had on the asserted change which takes place in wrought iron when subjected to repeated blows.

With the common rail, the wheel receives a shock at every joint, caused by the settling and wear of the rail in the chair. Similar shocks are received at the curves, and they are communicated with increased force to the axle in consequence of the leverage of the wheel causing constant vibration, which, it is alleged, changes the texture of the iron from fibrous to crystalline, greatly diminishing its tenacity.

In the appendix will be found an extract from the report of the Commissioners appointed to inquire into the application of iron to railway structures in Great Britain, giving the result of various experiments and investigations on this subject. [See appendix No. 1.]

Upon some of the roads we have observed that the size of the axles and journals has been greatly enlarged beyond those in common use, and it is believed that, in this State, they are generally all made of the best material, and forged in the best manner.

To guard more effectually against the accidents arising from the alleged deterioration of the iron from the causes above mentioned, it has been the practice, on some roads, to run the wheels and axles one year only under passenger cars, and then transfer them to freight cars.

The safety beams have been introduced on the cars of many of our roads, by means of which the axle is upheld when broken. This has undoubtedly been the means of safety, by keeping the fractured ends of the axle suspended until the motion of the train could be arrested; but, in many cases, it is not calculated to hold them with sufficient steadiness to prevent the wheels from leaving the rail.

The cast iron wheel is now generally in use.

The manner of constructing chilled cast iron wheels, necessarily involves imperfect work and inherent defects.

During the severe frosts of this climate, when the roadway has become very rigid, large numbers of cast iron wheels fail.

Wrought iron wheels have been frequently tried. An objection is made to their use in consequence of the flanges wearing sharp, and thus rendering them very liable to ride upon the rails.

Wheels, with cast iron tires and wrought iron arms or plates, have been suggested.

It is believed that if wrought iron wheels could be constructed, free from the objections to these heretofore tried, it would be found to result in greater safety to the passengers, and greater economy in their use.

The manner of attaching brakes is sometimes insecure, or they become so by use, and frequently cause serious accidents by falling upon the track while the cars are in motion.

Under the head of the defective construction of the superstructure, the danger of running engines and trains of too great weight, and at too high a rate of speed for the grades and curves, and for the strength of the road, has been already alluded to.

It is undoubtedly true, as alleged, that the public demand a very high rate of speed, but it is also equally true that there are rates of speed at which the locomotives and trains cannot be run over the steep grades and sharp curves of roads of imperfect construction, without a certainty of accident, and it would seem that if the community requires higher rates of speed, public safety as imperatively demands increased strength of superstructure, and the improvement of grades and curves.

The employment of incompetent or improper agents and workmen is, at this time, one great cause of accidents. The rapidly increased demand for services of this kind is, perhaps, the main reason for this. Companies, in opening their newly constructed roads to comply with the demands of stockholders and the public, are obliged to supply their various departments with agents, for whose competency and fitness they have no guarantee, and who are entirely untrained to those peculiar habits of implicit obedience to the minute rules and regulations, upon the prompt and unconditional observance of which depends the security of persons and property. By existing enactments, the officers of corporations seem to have little or no power of remedying the difficulty. It is a fact worthy of notice, in connection with this subject, that this class of persons, entrusted with the personal safety of almost the entire travelling community, are not held by any of those legal restraints and penalties which are applied to those having in their charge the most trifling pecuniary trust.

If a system of signals is not perfectly arranged, and carried out with the most minute accuracy, and strictly observed, it leads to accidents which would sometimes have been avoided by the entire absence of such signals, because, relying upon and giving their whole attention to them, the conductors of the train do not observe any irregularity *in the road.*

The usefulness of signals as a means of preventing accidents, depends upon their timely exhibition, and their being so placed that they can, under all circumstances, be seen at a sufficient distance to enable the engineman to arrest the motion of his train, before reaching the point of danger. For instance, if a train cannot be stopped by a prompt application of all the means at hand, until it has passed over a space of 600 yards, a signal which could be seen only 400 yards from the point of danger would be of little use. The committee believe that many accidents have occurred, either from want of due regard to instructions in this respect, or from a want of accurate knowledge of the distances required for arresting trains under the various conditions of the track, the different gradients of the road, the weight and velocity of the train, and consequently so placing signals, as to render it impossible to avoid the danger pointed out by them. Under any circumstances, signals are liable to the objection, that they are rather an inducement for conductors and enginemen to neglect a strict observance of their running time, or to pass over unsafe portions of road at objectionable rates of speed, feeling that any danger incurred thereby will be averted by their exhibition, in fogs or thick hazy weather, or during heavy snow storms, the flag or light signal are of course useless. The fog signal, composed of detonating powder, which, being attached to the rail explodes when the engine passes over it, should always be used under such circumstances. It has quite recently been introduced upon one of our roads, and should at once be adopted by all. Several serious accidents that have come under the observation of the committee, would been prevented had it been used.

The committee have received from Henry O'Reilly, Esq., a communication on the subject of the application of his telegraph system to railways, for the purpose of avoiding accidents thereon. This communication will be found in the appendix. (See No. 2.)

The failure of conductors to make their time as laid down in their time tables is a frequent cause of serious accidents, particularly on roads where numerous trains are run at different rates of speed and at short intervals.

This great fault is attributable to the incompetency of enginemen, to disregard or want of attention of conductors to their time tables, to attaching trains of too great weight to locomotives defficient in capacity, thereby rendering it impossible for the engineman to make his time when the grades are heavy, or the curves objectionable, and compelling him to gain it by running at too high a speed over those portions of the road where less power is required, and thus passing switches and turnouts where trains of an inferior class are expected to get out of the way, stations at which they do not stop, or portions of the road undergoing repairs, at uncertain times and at objectionable velocity, or it may be attributed in some cases to the time being, so arranged by the tables as to render it extremely difficult, if not impossible with the utmost care and attention on the part of the conductor or engineman, to make the exact time under all conditions of the track, weather, &c. Most of the accidents that occur, are, in some way or other, due to this cause. Trains approach each other from the fact of one or both being out of time, and consequently out of their proper position. When signalled, or seen even, the intervening space may be too short for stopping, and collisions are the consequence.

Employers engaged in repairing defective portions of the road before or after trains are due, may be so intent upon their work as to render them heedless or forgetful; may be remiss in fixing signals, or, in their hurry to escape, may leave implements or other obstructions on the track, or the track may be left in a condition dangerous for the trains to pass. Injuries to the men, or derailment of the trains are the consequence.

At stations, in the haste to gain time, passengers are hurried to or from the cars, or, in the confusion, remain in dangerous positions on the platform or steps, fall or are drawn under the wheels. Servants discharging their duties about the train, have not time to remove from exposed situations, and are often killed or injured.

When trains are not punctual as to time, the agents of stations not having, perhaps, any definite rules to act upon, are left more or less, to rely upon their own judgment, and much consideration is required at every station as to how the safety of other trains will be affected by their action. Embarrassments are produced, and accidents occur, from a want of foresight, in not thinking, in the hurry of their occupation, of all the circumstances bearing upon the trains in consequence of their being out of time.*

INSUFFICIENCY OF BRAKE POWER.

One of the most effectual means of preventing the occurrence of a numerous class of accidents, is the power of promptly arresting the progress of trains. Its adequacy depends upon the number of brakes, and of the men appointed to apply them, and on the promptitude with which they discharge their duty. The extent of the necessary means varies with the weight and speed of trains, with the grades and curves of the road, and the condition of the rails and weather. There is no defect in the working of trains so reprehensible, an an insufficient provision of the necessary means for this purpose; and it is incumbent upon those having the management of trains, to ascertain with great accuracy, within what intervals of time and distance their trains can be stopped under all the various circumstances above mentioned, and to see that the brake power is always amply adequate to meet all possible contingencies arising from the nature of their road, and the character and extent of its business.

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* A report of Capt. Simmons, of the Royal Engineers, made in June, 1852, to the railway department of the Board of Trade, of Great Britain, on this subject, will be found in the appendix. (See No. 3.)

* It may be well to state, that the interval of space required to arrest a train, increases in the ratio of the square of the speed; that is, with the same brake power applied, a train running at the rate of 50 miles an hour, will pass over four times the space before it can be arrested, that it would, if running only 25 miles per hour.

The safety of trains, and the prevention of accidents, being so directly dependent upon the adequacy of this power, the committee feel it a part of their duty to state, that it is one of the most apparent defects in railroad management which has come under their observation; and several of the most disastrous accidents which have occurred, may be attributed to this cause.

It is true that an increase of brake power can only be obtained by an increase in the expenses of running trains, but its importance to the safety of passengers is too great to allow it to be neglected for any considerations of economy.

RUNNING TRAINS TOO CLOSELY FOLLOWING EACH OTHER.

The dangers arising from this cause grow out of the neglect of the several trains occupying the same track to maintain their proper running time, or by accidents causing delays, or by insufficient brake power, as has been already stated. Many important considerations in regard to this subject will be found in the appendix already referred to, marked No. 4.

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* In the appendix will be found an extract from the report of Captain Laffan, of the Royal Engineers, made to the railway commissioners of Great Britain, containing minute calculations i reference to this subject. (See Appendix, No. 4.)

RUNNING ENGINES AND CARS TOO GREAT A DISTANCE WITHOUT THOROUGH INSPECTION.

The complexity of the machinery, and its liability to injury from the imperfections of the roadways and the high speed, make a frequent inspection necessary, to lessen the danger of accidents resulting from this cause.

The liability to accidents originating in this manner, must necessarily be in proportion to the distance run without such thorough inspection as is necessary to discover and remedy injuries which the engines and cars receive, for it cannot be supposed that such an inspection can be made, and the remedy applied, during the short intervals of the stoppage of the trains at the several stations.

INSPECTION.

The decay of the materials which are used in the superstructure, and the severe use to which it and the rolling stock are constantly put, make a constant and vigilant inspection necessary. When this is neglected, accidents of a serious nature must ensue.

PERSONS AND DOMESTIC ANIMALS UPON THE TRACK.

It is perhaps a just complaint on the part of the railroad corporati, onsthat, with the existing enactments and the prejudices of the public, they have not the power to guard against the frequent casualties that arise from these causes. Cattle or other domestic animals are left by their owners upon the track, at crossings, or get upon them through gates, or bars, carelessly or perhaps designedly left open; and although it is unlawful for the public to ride, drive, or walk upon it, except at crossings it is nevetheless, constantly occurring and it is a very frequent cause of serious accidents. It is quite evident that it is impossible for companies to fulfil their engagements to the public unless they can run their trains without delays or hinderances of this kind, and that the safety of passengers requires that efficient means should be afforded for preventing them.

The right to occupy road crossings at the time when the trains are passing would imply the right of delaying all trains, and consequently causing serious inconvenience to the public. It would be unjust to exact regularity in the running of trains, and at the same time allow of obstructions which would render it impossible.

The accidents occasioned by the intrusion of cattle and other domestic animals upon the track, may, however, be attributed in some degree to a want of due care on the part of companies to see that the fences are kept in good repair.

IMPRUDENCE OF PASSENGERS AND WORKMEN.

A large proportion of the injuries received by passengers and employees, is the result of carelessness, ignorance and insubordination.

To passengers these accidents occur by attempting to get upon and off from trains; by standing upon the platform and passing from one car to another while in motion, and by exposing their persons beyond the side, of the car.

The employees must necessarily be exposed to the dangers incident to railroad management. Many injuries are received by them while performing their duties at stations, and in coupling cars, and by exposure of their persons while the trains are in motion.

II. THE MEANS OF PREVENTING ACCIDENTS.

From the above enumeration of the various causes of accidents, it will readily appear how much their prevention depends upon the faithful and prompt discharge of the duties devolving upon the agents entrusted with, or in charge of the numerous departments of railroad management.

Few casualties occur, which cannot, in their first causes, be traced to some neglect or omission in these respects:

A switch may be improperly adjusted by the remissness of the person having it in charge. The signal of danger may be omitted or neglected to be observed, when made. Trains may be placed in dangerous proximity to each other, from disregard to time tables. Defects in machinery may be undiscovered for the want of careful inspection. There may be a want of sufficient brake-power, or neglect of its prompt application; and the results are the derailment of the trains, collisions or other casualties, causing serious injuries, and the destruction of life and property.

It would appear, therefore, as a general rule, that the remedy must be found in some means that will induce a more rigid enforcement of the regulations made for the management of railroads, a more prompt and implicit compliance with them by the subordinates acting under their guidance, and in a controlling influence that will induce railroad corporations, at all times, to bear in mind that the safety and accommodation of the public are the first and important considerations for which they have received their corporate rights and privileges.

It may be true that the managers of railroads, who are well aware how much the interests of their associations are involved in the prevention of accidents, do all in their power for the public safety, and that, under many circumstances, the causes which mainly endanger it, are, in a great measure, beyond their control. If so, additional legislation is required, and railroad management should be placed under such supervision as will enable the State to obtain a thorough knowledge of the causes of casualties, to ascertain where the difficulty lies; and then, if found necessary, give to the officers of companies, such additional powers of control as may be required for the greater safety of the community.

III. TO SUGGEST THE NECESSARY LEGISLATION, IF, IN THEIR OPINION, ANY IS REQUIRED.

The subject of legislation, with a view to prevent the recurrence of casualties, is, necessarily, so connected with that of State supervision over all the departments of railroad management, and involves so many important considerations in reference to the greatest benefit and safety to the public, that the committee have deemed it their duty to give to it a somewhat detailed consideration.

The right of a people to have free access to each other for the various purposes required by the conditions of society, is an inherent right, and the power of improving, or in any way altering the means adopted for these ends, cannot be taken from the public, except with their consent. The roads or means of intercommunication of a country, are, therefore, a part of the general interest, and, from the earliest periods, the sovereign power, under whatever form it may have existed, has ever held the right of controlling them for the general good. The practice, which grew up of intrusting their construction and management to associations formed for that purpose, was only a delegation of its powers, in order to secure in a greater degree, the welfare of the community. An irrevocable transfer of its powers was never designed.

In retracing the legislation of our State in reference to such associations, it will be seen that the inherent powers of the State have been distinctly asserted and carefully guarded.

The Legislature, acting for the general welfare, in granting to them such privileges as might best meet the public wants, has invariably reserved the right of modifying and controlling their privileges in any way or manner best calculated to secure these objects.

When the projectors of railroad enterprises first began to ask the necessary privileges and immunities from the State, it will be seen that these have been granted with well defined limits and conditions, reserving the right of altering or modifying them, from time to time, and of limiting the periods of their corporate existence.

The last general enactment, (the Railroad Law of 1850,) in addition to reserving the right of annulling or dissolving any corporation formed under it, and of reducing the rates of fare under certain conditions, has compelled all companies to make, annually, a detailed statement under oath, of all their operations, both with regard to finance and management, for the purpose of furnishing the State with reliable statistical information for its guidance, whenever the public welfare and safety should require additional legislation with regard to them. In no sense can railroad corporations be considered as placed beyond the control and supervision of the State. In granting them their corporate privileges, it was intended and designed that they should be used with a view to the welfare and greatest possible benefit to the community, and the sovereign power neglects its duty, if it does not guard against their being made subservient to other purposes, or if it fails so to modify and control them, as to secure to the public the greatest possible amount of benefit compatible with the full development of so great an element of *industrial progress.*

It is also worthy of remark, that independently of the right expressly reserved by the Legislature to modify, alter or repeal the railroad charters, their proprietors, as the grantees of a *public franchise*, to be exercised for the *public benefit*, are liable to a liberal control when necessary to the public interest, by any future Legislature, whose power over them is not to be limited by implication. (Charles River Bridge *vs.* Warren Bridge, 11 Peters' Reports, 420.)

Is it expedient to place railroads under the supervision of the State, to insure greater safety to the travelling community, as well as to secure the greatest amount of public benefit from them?

A long and persistive course of legislative interference with the various pursuits of commercial and industrial enterprise, and with the complex relations of supply and demand, for the purpose of protecting the public interest, has abundantly proved the fallacy of the principle upon which it was based. Enlightened public sentiment now justly condemns any restrictions, by legal enactments, upon the free operations of traffic, and in all that relates to cheapness, facility or accommodation, the best security for the public welfare will, as a general rule, be found in the untrammelled and free competition of individual enterprise and capital.

It therefore, only remains to inquire whether this general rule of competition, when applied to railroads, will secure to the greatest possible extent, the safety of the travelling public and the general welfare, and whether, with these objects in view, the State has done its whole duty in granting to them the exclusive rights and privileges required for their successful operation.

As regards intercommunication by railroads, as compared with any other mode at present known, it requires no argument to show that there can be no competition, and that, until human ingenuity shall have developed some new element applicable to such purposes, they are in possession of an unapproachable monopoly, exclusive just in proportion to their superiority. The same may be said with regard to competition upon any single road or series of roads under one control or management. At one time it was supposed that the traffic upon them would be open to competition, and that by this means the greatest possible benefit to the public would ultimately be secured; but it has long since become apparent that their indiscriminate use by the community is impossible. The accidents that now so often occur from want of due regard to time and minute regulations, clearly demonstrate how impracticable it would be to allow the running of trains by rival parties at various rates of speed on the same road, like competing stage coaches on a public highway. The safe working of a railroad requires a unity of action and perfect combination of arrangement, which cannot be obtained without confining the management of its carrying traffic within the limits of its general control. Hence, all companies have now the exclusive management of the entire business upon their roads; and this arrangement seems an absolute necessity, without which the whole railroad system would soon become impracticable; showing conclusively that the principle of competition is inapplicable and can never be calculated upon as a means of securing any additional safety or benefit to the community,

May not these advantages be secured from the competition between rival lines running in similar directions, or having the same termination ?

The principal lines of road in this State passing as most of them do, through portions of country sparsely populated, the resources of which are as yet but partially developed, cannot be expected, at this time to furnish in their operations any statistics or reliable facts from which to estimate the probable advantages the public are likely to derive from their competition. It would seem, however, at present, in reference to reduced rates of traffic or accommmodation along their route, or regard for the safety of passengers, that little, if any increased amount of public benefit has been attained; and it seems doubtful even when these shall have received their full capacity for business, (many of them being yet unfinished,) and perfected in all their various departments whether the principle of competition will apply to them. It undoubtedly will not, except in very populous districts, where the business is likely to be enough to afford adequate incomes to rival lines; but even in such a case, it may be questioned whether the public interest is enhanced by competition. Our large cities which may be the common termini of a great number of roads may perhaps derive additional benefit from competition for the traffic that passes over the whole extent of their routes, but the community along the intermediate portions, where there is no competition for the way business, receive none of its benefits, but are, on the contrary, often disproportionally taxed, and deprived of many of the facilities which are their due, to enable the companies to secure the through traffic.

Taking it for granted, that a large portion of the cost of transportation consists of the amount of capital expended, it is evident that an equal amount of business could be done much cheaper, with the same profit, on one line, than if the same were divided between two, with an outlay of twice the amount of capital; consequently, the general welfare would be more effectually promoted by a single road properly restricted, than by competition between rival companies.

The ultimate effects of competition would be diminution of revenue, embarrassments in meeting current expenses, inability to maintain the roadway and *materiel* in an efficient and safe condition, and a proportionate diminution of the facilities of traffic and of the adequate means of safety to the traveling public.*

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* Mr. William Reed, who was at the time extensively connected with railroads in France, stated in his testimony before a committee of the British Parliament, that the lamentable disaster that occurred between Paris and Versailles, by which upwards of one hundred lives were sacrificed, might be traced, in its first causes, to the competition between the two rival roads then in operation, the company being so crippled in its resources thereby, that it was unable to keep its machinery and other materiel in a proper condition.

But, admitting the benefits of competition—there can be no guarantee to the public that it will be continued. The advantages to be derived from combination between rival companies, having no competition to fear from any other known mode of intercommunication, are so obvious as to leave little doubt that an amalgamation of their interests in some manner would be the ultimate result. In England, where the great number of railroads running through a comparatively limited space of territory, would sooner test the question of competition than here, experience has abundantly proved the correctness of these views. Close competition has been maintained in reducing rates of traffic, and furnishing additional means of preventing casualities, and the community have, for a time, enjoyed the consequent benefits. These contests, however, have always ended, as they inevitably must, by combination, or some other arrangement which has deprived the community of all the advantages to be expected from competition.

As early as 1846, a select committee appointed by Parliament "to inquire whether conditions might not be embodied in railway acts, better fitted than those hitherto in them, to promote and secure the interests of the public," expressed their opinion, very decidedly, as to the hopelessness of looking to competition for the means of securing the interests of the public—stating the fact "that the more powerful companies had not only obtained the control of railway lines from which competition might be apprehended, but had also succeeded, by various means, *in obtaining a control over the canals, which, for a time, maintained competition with them in the carriage of heavy freight, and had thus deprived the public of all the protection at one time anticipated from this source.*" Nearly all the witnesses that appeared before the committee, comprising gentlemen of the highest character, connected with railroads, gave it as their opinion "that the public can never be benefitted by the competition of companies." Mr. Robert Stephenson was of the opinion that the power of supervision should extend to vetoing the construction of competing lines to protect the public against the increased rates of traffic that would be necessary to remunerate the additional capital employed for that purpose.

It would appear, therefore, that the principle of competition cannot, as a general rule, apply to railroad corporations, and that the interests of the community should not be left to its operation as in ordinary business enterprises; that they must, from their peculiar elements be, in a greater or less degree monopolies, and necessarily liable to the evils of monopoly. These evils are not probably, as great at this time as they may be hereafter, when the system becomes more perfectly developed, and placed under the management of persons less disposed to show deference to public sentiment; nor are they as yet very perceptible to the public, from the fact that they are not apparent in any direct loss to the community; for railroads under any system must be a great benefit, but consist rather in depriving it of the additional advantages it would otherwise obtain. It is nevertheless due to the community that the tendency of these evils should be checked, and if the above views are correct, it is incumbent upon the State to place the whole system under such control and supervision as may be deemed necessary to secure the greatest amount of public benefit compatible with a due regard to the pecuniary interests involved in the operations of railroads.

It may be urged that it would be unjust to subject railroad corporations, which have done so much for social advancement, to any interference which is not applied to other industrial associations.

It must be replied to this, that companies formed for mercantile, mechanical or commercial purposes, are generally private in their character, and their operations have but little effect upon the community beyond their individual stockholders. On the other hand, railroad corporations, by means of the great powers granted to them, are building up a system of intercommunication so superior to all others, as to compel its exclusive use by the community. There were 2,500,000 tons of freight and 10,000,000 passengers carried upon our railroads the past year, and there is already invested in them the enormous sum of $100,000,000. This amount must be greatly augmented for some years to come, in laying down double tracks, in completing roads already commenced, and in constructing others that now are or may be hereafter projected. They will soon monopolize the entire passenger and a portion of the freight transportation of the State. They must move our troops and munitions in time of war, and perform the mail service. "Their management, therefore, involves public and social interests of vast magnitude," and, although much praise is due to the individual enterprise that has so rapidly developed this great element of social progress, it must be borne in mind that these associations owe their origin to the legislative will, and the great public interests affected by their operations, make it the duty of the State to exercise a careful supervision over them; and, if required, to modify their powers from time to time.

If these views show the necessity of supervision, we are next to inquire in what manner it should be exercised. Should authority be given to interfere with the details of railroad management, to regulate the running of trains, to arrange time tables, to appoint and remove, or otherwise punish employees for neglect or violation of duty, &c. It is possible that instances may occur where interference of this kind might be necessary, but the committee can see many reasons why recourse should not be had to it, at least until it shall become apparent that the object in view cannot be attained by other means. The working of a railroad requires the accurate arrangement of a great variety of details, and a prompt discharge of all the duties assigned to the several departments of its management. To divide the authority from which the regulations necessary to effect these objects must emanate, would give rise to confusion and embarrassments, engender bad feelings and hostility on the part of companies, *take from the officers their responsibility*, and might result disastrously for the safety of the public.

The committee therefore, entertain doubts as to the beneficial results of any legislation at this time, having for its object direct interference. They are, however, of the opinion that the public safety and welfare would be enhanced by placing railroads under he rigid supervision of the State, giving to the authority created for that purpose such powers as will enable it to obtain full information in regard to the management of all corporations formed for such purposes; to see that their corporate powers are not exceeded, to the injury of the public, and that the legal requirements in relation to them are fully complied with; to call for the most accurate returns and statistics and to give the most ample and unreserved publicity to all the details of their operations for the purpose of enabling the community to judge from the representation of responsible and disinterested authority, of the skill and fidelity of their management. Power should also be given to investigate and ascertain all the facts and circumstances in relation to casualties, with a view to suggest the best means of preventing their recurrence, as well as to protect companies upon whose lines they occur against false statements and misrepresentations in relation thereto. Such authority, properly constituted with ample powers of supervision, would, in the opinion of the committee, be enabled to correct many of the abuses of railroad management, merely by investigating them thoroughly and bringing them before the community. Their publicity would, of itself, suggest the remedy, and public sentiment would soon compel its application.

Should this, however, prove insufficient, the information and facts thus carefully obtained and reported annually to the Legislature, would form a reliable basis for any further enactments that might from time to time be deemed necessary for the public safety and welfare, care being taken to impose no unjust restraints upon the individual energy and enterprise to which so much is due for the rapid growth of our railroad system,—to lay no obstructions in the way of this mighty engine of industrial progress, but rather to guide it in such a manner that the whole people may enjoy to the fullest possible extent the countless benefits developed in its onward career.

All of which is respectfully submitted.

WM. J. McALPINE,
State Engineer and Surveyor.
HENRY E. BARTLETT,
Chairman of Committee on Railroads, in Senate.

APPENDIX.

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(A 1.)

At a meeting at the State Engineer's office, in the City of Albany, of the select committee appointed by the following resolution of the Senate, viz:

"In Senate, *April* 15, 1852.

"On motion of Mr. Babcock,

"*Resolved*, That the State Engineer and Surveyor, and the chairman of the standing committee on railroads, be required to examine and report to the Legislature, at the commencement of its next session, the causes of railroad accidents in this State, the means of preventing their recurrence, and their opinion whether any, and if so, what legislation is required on the subject." It was

Resolved, That the following interrogatories be addressed to the several railroad corporations of this State; the answers to be forwarded to the office of the State Engineer and Surveyor, at Albany, on or before the 15th of October next.

Resolved, That they be also requested to furnish such other information and suggestions as may the better enable this committee to comply with the requirements of the resolution under which they act.

Resolved, That a copy of these resolutions, and of the interrogatories, be forwarded to each of the railroad corporations of this State.

INTERROGATORIES.

I. ACCIDENTS.[*]

1. What was the first accident which occurred on your road,

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[*] By the term accident, is to be understood any injury to the property of the company, or to the persons or property of individuals.

after your report to the State Engineer and Surveyor, of the 30th September, 1851 ?

When and where did it occur ?

What was the cause of the accident, and the cost of the same to the company, and the nature of the injury to persons and property ? stating all the particulars in each case.

State the time, place, and particulars, as above, of each accident which has occurred since that date and up to the 30th of September, 1852, inclusive, or to the date of the reply to these interrogatories.

In reply to the above interrogatories you will state on what class train the accidents occurred—whether or not the trains were in due time, according to the time tables—whether occasioned by collisions, broken wheels, or axles, defective rails, wrong position of switches, (if so, the cause of the switch being wrong,) impediments on the road, (stating the nature and cause of the impediments,) defects in machinery or rolling stock, or defects in the superstructure or roadway.

In replying to the causes of personal injury, state whether it was occasioned by jumping or falling off the trains while in motion—by collisions—by thrusting the head or limbs out of the windows—by standing on the platform—by being run over or against while standing or walking on the track—whether it occurred at road crossings, to men at work on, or standing by trains—from defects in the machinery or road, or from any other cause.

3. How many cattle or other domestic animals have been killed or injured during the period above mentioned ?

How much has been or is to be paid for damages to the above-mentioned properly in each case ?

4. What precautions do you take to prevent the occurrence of accidents—stating, in detail, your system of signals, by flags, lights, telegraphs, &c.

What is your practice in making examinations for the purpose of detecting defects in locomotives, cars, wheels, culverts, tunnels, bridges, rails, and other parts of your road and rolling stock, &c.

5. Have you adopted any other precautions than those required by law to prevent accidents at street and road crossings, &c ?

6. State the number and the duties of each class of persons employed in the management of the road, not including those employed in construction, and the wages per month or year páid the same.

7. What is the shortest period of time between the starting of the different trains from any stations on your road?

II. CHARACTERISTICS OF THE ROAD.

1. Furnish a table which will show consecutively the length of each grade line, its elevation above tide, and grade in feet per mile.

2. Furnish a table which will show, as above, the length of each straight line, and the length and radius of each curved line.

2. What is the weight of the rail per lineal yard of each portion of your road?

4. What are the dimensions and the distance apart from centre to centre of the cross-ties, on each portion of your road?

5. How many street and road crossings are there at the level of grade, and how many above and below the level of grade?

6. How many switches have you upon your road? How many at each point? How many switch tenders at each point? Do any of these perform other duties? If so, name them.

7. What portion of your road has been fenced by your company, and what portion by the proprietors of the adjoining lands, and what portion, if any, is not fenced?

8. What space clear of all obstructions is there between the sides of the car and the sides of the bridges, tunnels, rock cuttings, &c.

State the weight of the several locomotives and tenders, when supplied with fuel and water, and the portions of the road on which they are generally used, and the class of trains hauled by such engines.

What is the maximum weight of your passenger, freight and baggage cars, and what is the greatest weight carried in any freight cars, and what the greatest number of cars in your trains?

What is the least diameter of the axles of passenger and feight cars, and of the journals of the same?

Have you safety beams on all your passenger and baggage cars ?

What is the maximum running speed of your express and other classes of trains ?

How far are your engines or cars run between the regular places for thorough inspection, and by what class of your employees are the inspections made ?

WM. J. McALPINE,
HENRY E. BARTLETT } *Committee.*

(A. 2.)

Office of the Syracuse and Utica Railroad Co.
Syracuse, *October* 1, 1852.

Gentlemen—I have received your circular of interrogatories upon the subject of accidents upon the railroads, and have delayed a reply to this day, so that a year might be fully embraced as the period covered by the questions and replies, so far as respects this company.

I take pleasure in answering the questions, because I am sure that from full replies from all the railroad companies in the State, much valuable information will be obtained; and the public and the Legislature will have the best data for forming sound sentiment and proper enactments.

In enumerating accidents that have occurred upon this railroad, I will first state in their order, those that have happened to persons, with the dates and respective circumstances.

1. *October* 8, 1851. A man employed by the company as a common laborer on the gravel train, was killed at Verona. His name was Patrick Murray. He was sitting upon the edge of the car, and as he approached the station he attempted to change his position, in doing which, he fell under the train and was killed.

2. *November* 26, 1851. Ebenezer Ehle was employed by the company at the Syracuse freight station, was killed under these circumstances: His business was to see to the tallying of freight, and also to make up the freight trains; while he was attaching the cars in a train, he fell upon the rails, and the engine and the tender passed over his arm and foot. He died the next day.

3. *December* 8, 1851. A man was killed while lying upon the track, at the bridge over the Erie canal in Rome. His first name

was supposed to be Thomas; his sirname not known. The coroner found that he came to his death by being run over upon the tracks of the railroad by an engine and train; and it was their belief that he placed himself there for the purpose of being killed; as he said the day previous, that he would do so. He was believed to be intoxicated when last seen.

4. *January* 5, 1852. The passenger train going west, at about 2, p. m., struck a pair of horses and wagon in which were three men, at the crossing of the plank road, in the town of De Witt. One of the horses was killed, and the wagon much broken. The men were bruised, but not seriously; no bones broken. There was the usual and proper sign at the roadway. The bell of the engine was rung, and every precaution taken by the engineer and brakeman to avoid a collission. The ground is level and entirely favorable for the persons in the wagon to have seen the train; but they were probably prevented from hearing it, by the noise of their own wagon, and they were wrapt up closely. After the most careful examination, I could not see that any person employed on the train, was liable to censure. The train was at the usual time, and at its common speed. The men injured were poor; and one of them was paid $15, on account of the personal injury, and the other was paid $200 for the loss of his property and the personal injury. This payment was not because of any liability, but that the case was a hard one for these men. They were unguarded, but evidently had no design to run any hazard.

5. *February* 7, 1852. On the up passenger train from Utica, in the afternoon, a passenger by the name of Robert Freeman, was killed at Oriskany. He had paid his fare to Rome. When the train arrived at Oriskany, he was sitting in the back end of the passenger car, and must have gone to the forward end of the car, and stood upon the platform. When the train started, he fell under the car, and part of the train passed over him, crushing him so, that he died soon after being taken out. The train was stopped before going the length of two cars, and he was taken out from under the train. There was ample room in the train, and notices in the cars that passengers should not stand on the platforms.

6. *March* 13, 1852.—A man by the name of Bakeman, (christian name not known,) was killed by the morning down passenger train near Green's Corners. It was a very foggy morning. He was walking between the rails, and was not seen by the engineer until the engine was very near him. It was not possible to stop, and he was instantly killed.

7. *April* 10, 1852.—Harman Fowler, a boy about 14 years ot age, residing near Canastota was killed by the express train going east, at about 4 P. M. The mail train coming up on the north track, was at Canastota. This boy, with others, was at play south of the railroad. Seeing the mail train he ran towards it (in the apparent design of jumping on,) through the wood house, and stepped on to the south track. At that moment the down express train came up on that track, and he was instantly killed. He jumped on to the track but a few feet ahead of the engine, and escape was impossible. A man splitting wood under the wood house saw the boy pass him upon the run. The bell was properly rung and the train was at the usual time.

8. *May* 25, 1852.—Edward Littlefield, a small boy, was found on the track by a repairing party. He was bruised and insensible, and he soon after died. It was supposed that he was playing with other boys near the freight train which was just before going east, and that he got on to the back end of the last car, and that his clothes became fastened to the bumper, as it was said that some persons saw the train dragging him in this way. There were 15 cars in the train. No one on it saw him or knew anything of the circumstances.

9. *July* 8, 1852.—Charles C. Ross, a brakeman on the express train, going east, was standing on the steps of a platform of a car leaning out and looking back. He was either knocked off the train by the bridge, or he there fell from the car. He was found in the Oriskany creek. His head was severely bruised, and he was otherwise injured, but he has recovered.

10. *August* 9, 1852.—Frederick Gratman, a German, was killed by the express train going east, on the track, in the town of Ve-

rona. The engineer discovered him, and blew his whistle, and checked his train. He was apparently arranging his dress or some bundles, and when the engineer blew his whistle he stepped off the track. Just as the train got to him he stepped back to pick up a bundle or valise, when the engine struck him, killing him instantly.

11. *August* 13, 1853.—The mail train coming west, killed a man just east of Rome. His name not known. He was at work for a man who was getting stone for the company. He had left a bar or something on the track, and as the train approached, he ran to get the bar off. He stooped forward to take it, and was struck by the engine, on his head, and instantly killed.

12. *August* 18, 1852. Joseph Thompson, of DeWitt, was killed by the express train going west, in the town of DeWitt. He was walking west, on the outside ends of the cross-ties on the north track. This was the right hand track coming west, and therefore the one upon which the up trains run. A freight train was going down upon the south track, and the engineer and men on that train saw him walking on the outside of the other track. They also saw the train coming west behind him. The engineer and men on the freight train, as they passed him, made signals to him to warn him of his danger. These signals were not regarded by him. The engineer of the express train coming up behind him, blew his whistle, and tried by this means to alarm him. The whistle was loud, and could be heard for a long distance. He did not regard this, and the engineer then attempted to stop his train, and the brakes were applied, but the engine struck him and knocked him down, and he died soon after. This was a train of 6 full loaded cars, having 162 through first class passengers. Mr. Thompson had lived adjoining the railroad ever since its construction, now more than 13 years. He owned land adjoining it. The trains passed in plain sight of his house. The express train passed at its usual time. The place where he was walking was properly fenced. He walked upon the railroad probably to save distance.

13. *August* 23, 1852. A boy, whose name was believed to be Shepard, was killed a short distance west of the Manlius station. He was a stranger, and was waiting about the station. In the

evening he started to walk west on the track; the emigrant train coming west was then in sight. He evidently attempted to get on the train, and was killed,—no one saw him.

14. *August* 25, 1852. An Indian, who was a passenger on the down train, fell from the platform of a car on the Oriskany creek bridge, and went into the water. He said another Indian pushed him off, but an Indian woman said he was drunk. He was considerably bruised, but no bones broken.

15. *September* 28, 1852. An emigrant passenger named Alexander Dickson, in attempting to get on to the emigrant train at Rome, after it had started, slipped and fell against a car standing on a side track. He subsequently died from the injuries rceeived.

These are all the cases of personal injury that have occurred during the year. Not the least blame can justly be attached to the engineers, conductors, or brakemen upon the respective trains where these accidents occurred. I know of no cause of accident upon railways resulting in personal injury, that at all compares with that of persons walking and being upon the tracks. The great destruction of life that arises from this practice ought to be a warning, but it passes unheeded. Since the last case of death above stated, we have sometimes counted the number of persons walking upon the track which a single train would see, and they were nearly equal to one per mile. Now if this practice is to continue, it will entirely impair the usefulness of the railroad. Men do sometimes get upon the track, and will not step off till just as the train approaches them; when the steam has to be shut off, the train checked, and a serious loss of time besides increased wear occurs. A few persons could thus so check a train as that the required speed could not be made. The constant habit of so walking upon the track leads the engineer to suppose that each will step off, as they all do. We have put up signs along the road cautioning people not to walk upon the tracks. We warn them not to be upon the road, and do every thing in our power to prevent it, without success. At the stations, passengers will often stand within the tracks and may thereby be injured by an approaching train which does not stop at such station. All trains do not stop at the same stations, and the express trains make but few stops. There is no necessity for passengers or others standing upon the tracks at the stations, and they are certainly not right if they thereby cause trains to be stopped, or if they hazard their own safety. This remark is made because I have frequently seen comments in the public papers unfavorable to railroad managers, because the trains run by stations at such a rate of speed as to endanger, and perhaps actually injure persons upon the tracks at such stations. They must run by them, if the required speed is to be maintained.

Another cause of personal injury is, that men and boys who are not passengers at stations, are in the habit of getting on to the cars and then jumping off. A great many are hurt in this way. One fatal case of this kind is above stated. The whole public should be properly advised and justly impressed as to these matters. The railroad companies should be sustained in every effort to secure personal safety, and to render their service of the most efficient character. Passengers will very rarely be injured, if they will not get on or off the trains when in motion, and will keep their seats. The rules of the company are proper and public upon these points, and they can easily be obeyed.

It is due to the conductors and to truth, to say that among the great number of persons travelling, there are some upon whom any restraint is annoying, and they are unwilling to be controlled. They repulse attempts to advise them as to jumping on or off the trains, and as to standing on the platforms.

Persons, other than passengers, and employees upon the railroads, will very rarely be injured if they will only use care, and not be upon the tracks. They can always be watchful, and avoid danger at road crossings, and they ought never to be upon the tracks at any other place. Without some proper provision of law, it is impossible to keep them off, because the necessary force for this purpose would produce a dangerous feeling of hostility.

I have thus far enumerated, with care, the injuries to persons that have occurred on this railroad during the year ending this day.

Though we have, almost daily, some small break of some portion of the running trains upon the railroad, of all which we keep and preserve a careful description, I have not deemed it necessary to note any others, than the following, because they were in no degree of serious character.

November 8, 1851. As the up express train was passing the first roadway west of Whitesboro, a stone was thrown through the window of one of the passenger cars in the train. Although the car was filled with passengers, there was no other injury than breaking the window.

November 20, 1851. As the up express train was passing near Wampsville, a man threw a stone through the window of a passenger car, breaking out the whole sash, and slightly injuring a passenger in the face who was in his seat. The stone weighed nearly four pounds. The train was stopped at Canastota, and men sent back to find the person. Finally, a reward of $50 was offered for the arrest of the person. Two persons were arrested, tried, convicted, and sent to the Madison County Jail. The reward was paid.

These cases are mentioned, because the same thing has occurred many times before. It arises from the kindred spirit that places obstructions on the tracks, and that often changes the switches. The fear of such secret and dangerous attacks operates strongly upon railroad managers, and they, I doubt not, often feel constrained to surrender their rights to avoid these hazards.

June 27, 1852. A freight car filled with live hogs took fire, and burnt, so that the hogs were all suffocated. The fire took, as is supposed, from a spark, in the fresh litter prepared for the hogs. The loss to the company by this accident, was about $700.

July 15, 1852. A baggage car loaded with emigrant baggage, took fire about 4 miles East of Rome, and the contents were much injured. This class of baggage consists largely of bedding, bundles, and other combustible materials, and is apt to take fire. The loss to the company for this fire was about $900.

As this road is of double track, the trains down, or eastward, all run upon the South track, and those up upon the North track. To guard against the danger of one train following and running into another in the night, we carry a red light upon the back end of the train. All freight trains, in addition, carry a red flag upon the last car in the train, the object of which is that the engineman may see that his train is whole, by looking back at the flag.

Where a train is followed by another engine or train not in regular time, the forward engine carries a flag upon its front end.

At the stations that are passed by the trains without stopping, a signal arm painted white, or a white flag in the day time, shows that the tracks are all in order. In the night, a green lamp shows the same thing.

In the day, a signal arm red, or a red flag, shows that passengers are at the stations to take the approaching train, or that the train must stop for other cause.

All the repairing parties carry red flags and are required to set them up in the tracks, in proper positions, whenever the passing of any point is considered dangerous.

Whenever a train breaks down on the road, it is a first duty to send a man back with a flag in the day time, or a red light in the night, to warn approaching trains.

We are about using a torpedo, or explosive signal, which being fastened upon the rail, will explode when an engine passes over it. These will be useful in fogs or snow storms. They will be a signal to stop.

The locomotives upon this road, for their regular service, run twice over the road. They are carefully examined at each end of the road, daily. Under the system of cleaning and watchfulness which is pursued, incipient defects are generally discovered. Cars and car wheels are examined daily. The most difficult matter to detect, is the commencing fracture of an axle, or shaft. We now use large shafts of best iron, with a 3 inch journal. Since using this size, there are much fewer breaks of axles than before. Some times they will break suddenly. There is a theory that iron changes its fibre by long use, when such use is attended by a succession of shocks. The axle is subjected to both constant torsion and shocks, and by long use it is claimed that the iron changes, and it may break suddenly, appearing to be of coarse and poor iron, when, originally, it was of the best quality.

The danger of accident to cars is of course increased by running them long distances. Passengers ought to be willing to change cars often, for their safety is promoted by such change, as the new car will be inspected, oiled, and in good order; whereas, a car running over 150 miles, has, since its examination, been subjected to a use that fracture may have commenced. Though it would require more cars, and, perhaps, more time, yet I think it would be better not to run passenger cars over 100 miles.

It is the duty of the repairing parties hereinafter mentioned, daily to examine their sections, and see to every culvert, bridge, crossing, and to the tracks and switches, so as to be sure they are in good order. In addition to this, the track is run over every night, both ways, by men upon hand-cars. The regular daily service is, that the tracks are run over by each party three times within the 24 hours, upon the hand-cars; one trip of which is made in the night. This is found necessary to guard against obstructions, which may be placed by design or accident; to see that cattle or other domestic animals are kept off, and to furnish the best possible assurance that the road is in order. Much of our service is performed in the night, and this system of examination we have found of great advantage. The engineers run with confidence when they know that the road is thus examined. At many of the most important road crossings, we have placed men, with flags, to be at the place when the trains pass. We have proper signs and guards at every road crossing, and we have set posts at proper distances from them, which are marked so as to direct the engineers to ring their bell on approaching such crossing, There ought to be a provision of law by which the railroad companies may swing bars across the public roads at such crossings, so as to exclude teams, persons and animals, when the trains are approaching. This is done in Boston. A bill, containing this, among other provisions, was introduced in the Assembly, last session, by the railroad committee. There is a clear propriety in this, because many persons claim the right to be in the crossing with cattle, teams, &c., when trains are passing. Some will drive recklessly in front of an approaching train. Proper provisions would help to form a sound public sentiment upon this matter, and then there would be far less accidents of this character.

The road is divided into eight sections, making them about 6½ miles each. There is a party of men constantly employed over each section in repairing and watching the road, and in keeping the same, at all times, with bridges, culverts, guards, branches, switches, buildings, fences, platforms, signals and ditches, in proper order, and the whole fit for use. In summer, these parties are generally eight in number each. In winter, they are reduced to an average of five persons each. Over each party is a foreman, whose monthly pay is $30. The men are paid an average of $20 each per month. The company has provided good houses along the line of the road for each foreman, in which many of them board their own men.

Over these parties we have a track-master or overseer of the road, who is constantly passing over the road, superintending the repairs, and furnishing materials. He is paid a monthly compensation of $100.

The annexed time table for August 16, 1852, shows the run of the trains, and the time they are apart at the several stations. The two express morning trains are 50 minutes apart in starting from Utica. So the New-York express is 20 minutes before the mail at Utica, but it is more than an hour in advance at Syracuse.

The tables hereto annexed show the length of each grade line, its elevation above tide, and grade in feet per mile. Also the length of each straight line, and the length and radius of each curved line.

The north track of this road is laid with a rail of 61 pounds to the yard. The south track is laid with a rail of 70 pounds to the yard.

The cross-ties are generally laid a distance of 30 inches from centre to centre. They are of oak and cedar, and we intend to have them of 8 inch face and bed.

There are 33 roads which cross the railroad at the level of grade between Syracuse and Utica, without including the streets in either.

There are two roads which cross over the railroad, and one which crosses under.

The face of the country is so level that it is difficult to make road crossings over or under the railroad.

We have 71 switches upon the road.
At Utica we have 14 switches. There are two switchmen and one flagman.
Oriskany, we have two switches and one switchman.
Rome, 7 switches and two switchmen.
Green's Corners, 2 switches and one switchman.
Verona, 3 switches and one switchman.
Oneida, 17 switches. Here is a large wood depot, and a place for repairing cars. There are 5 men who attend the switches, and to furnishing wood for the trains.
Canastota, 3 switches and two men.
Chittenango, 3 switches and two men.
Manlius, 5 switches and one switchman.
Syracuse, 15 switches and four men.

The road being double track, but few of the switches are used in running the passenger trains over the road.

Almost the whole of the road has been fenced by the company. In some instances, we have paid the adjoining owners of lands for fencing, and taken agreements binding the land along side to maintain the fences, and in two or three instances took releases from fence. All such arrangements are unwise, on the part of the company. The person who assumes to maintain the fences, will generally neglect them, although he has been paid a large price for taking care of them.

In respect to fences, it is deemed proper to say that it is scarcely possible to maintain them, unless there shall be a proper disposition in the owners of property adjoining. We cannot, at every moment, watch the whole road. Our fences are very often thrown down by persons crossing the road. Boys, fisherman, and careless persons, will leave our gates open. They do, in fact, care rather less for the property of the company than for that of an individual. This lax feeling on this subject causes many domestic animals to get upon the railroad, at the great hazard of the travellers. They are sometimes actually turned on by their owners. We are very often indebted to the great weight of the locomotive for escape from injury in running over cattle.

In our State all such animals are *tolerated* in running at large. The railroad company is required, by law, to fence *against* them. We cannot always prevent their aggression. They will occupy the road crossings, and they try to get on to the railroads. The owners claim that they have a right to be in the public roads. We cannot stop for them. When the road is fenced, we ought not to be compelled to watch such cattle. In litigation, it is proverbial that the railroad company will be beat. The provision which makes the company liable if the road is not fenced, and has not cattle guards, is claimed to license the running at large of cattle. In Massachusetts the owner of all such animals is required to keep them enclosed. They escape at his peril. In many of the finest cultivated parts of that State, the yards and gates and passage ways are open to the street because there are no animals running at large in the roads. Until a different sentiment prevails here as to the running at large of such animals, there will be a constant hazard in respect to them, and the speed and usefulness of the railroad will thereby be checked. I regard this as next in point of importance to the restraining of persons from walking upon the tracks of railroads.

The space between the sides of the bridges, tunnels, &c., and the sides of the cars is generally about two feet. We have but two covered bridges, which are over the canal, and in these there is ample space. Our other bridges have low trusses that do not come up but a trifle above the level of the floors of the cars.

The locomotives upon this road are of various sizes; the heaviest class weighing about forty tons, with wood and water. Each locomotive runs over the whole road; and twice over the road is considered a day's service.

Our freight business is so irregular that we use most of our locomotives in drawing both passengers and freight. The freight business is not sufficient to require and keep up for that, a special class of locomotive engines.

The greatest weight of our cars is about ten tons. Some of our cattle cars are rather over that weight. Other freight and passenger cars are designed to be eight tons, but they rather overgo that. We mean to limit our load of freight to eight tons, but they often put ten tons on a car. The load ought not to exceed eight tons.

We now use axles of 4 inches diameter, with 3 inch journals, both upon freight and passenger cars. Since we have used this size journal, but very few have broken. We now put in no axles and journals of less size. There are a few axles remaining in the freight cars of 3½ inches diameter and 2¾ inches journals.

We have safety beams under all our passenger cars, and I believe they are also under all the baggage cars. The latter are owned by the Albany and Schenectady railroad company.

The maximum regular running speed of the quickest express train, is at the rate of 43⅙ miles per hour. Between stations, this train sometimes attains a speed of fifty miles per hour.

We have two brakemen on every train. The conductor acts as brakeman, when necessary.

Our engines run once over the road 53 miles, and then stop for a few hours and return. They are carefully examined at each end of the road. The person in charge of the motive power at Syracuse examines them; and at Utica we have a competent machinest, stationed, who has also for many years run a locomotive, who examines them there. His sole business is to see to them while they are at that station.

Our passengers cars generally run from Utica to Rochester, 157 miles. We interchange the use with the company next west of us. They are daily examined by a competent person at Utica, whose sole business it is to see to the cars, and have them put in order. They are also examined in Rochester, but I cannot speak as to the person who makes the examination, for he is under the employment of another company. Our baggage cars run through from Albany to Buffalo. There seems no way to avoid running them through, though, it would be better if they did not run so far. All these cars belong to the Albany, & Schenectady, railroad company, and we pay for their use, over our road. So also that company owns the emigrant cars, and their use we pay for.

Some time during the past summer I received from your committee a letter inviting suggestions from me in relation to the subject matter of your examinations, and I replied to it at once.

I beg to refer to that letter, and to ask that it may be taken as a part of, and as connected with this reply. I will only add that it was written before the sad disasters which have occurred within the last three months upon the rivers and lakes of our vicinity.

I am, very respectfully,
JOHN WILKINSON, *Prest.*

To the Hon. WM. J. MCALPINE, *State Engineer, and*
D. C. BARTLETT, *Ch'n. railroad Com. in the Senate.*

OFFICE OF THE SYRACUSE AND UTICA R. R. Co.
Syracuse, 1852.

Hon. H. E. BARTLETT, *Chairman, &c.* :

Dear Sir—I have received yours, with the copy of the resolution of the Senate, which constituted the State Engineer and yourself, a committee to examine and report to the next Legislature, upon the subject of railroad accidents, in which you ask for a copy of the road regulations, and time tables of this company, and for such information and suggestions with regard to the police and management of railroads, as may be calculated to assist the committee in their duties under the resolution referred to.

Herewith you will receive a copy of the regulations and time tables of this company.

The subject of accidents upon railroads, is a very important one. The causes should be truly understood, in order to consider properly the remedy.

I beg leave in the outset, to say, that the accidents upon railroads bear but a small proportion to those in any, and all other modes of transportation.

While the number of persons carried by railroad very far exceeds the numbers carried by water, the accidents thereon are far less. The destruction of life upon the western lakes and rivers, is perhaps, a hundred fold greater than that upon all the railroads in the Union.

The amount of accident, by explosions of engines in factories by the falling of buildings, and in the various mechanical employments, though the number of persons employed are quite limited, and are skilled in their business, is believed to be much greater than upon railroads.

Indeed, I think it will be found, on careful examination, that the railroad is actually, the safest known means of transportation; and that the same number of persons that have been safely carried upon some of our railroads, would not have been otherwise moved, either by their own, or by any other agency, with equal immunity from accident.

I have no doubt that accurate statistics will show the truth of these remarks.

1. There are some classes of accident that arise from our legislation, from our want of capital, and from a sort of general necessity to have this great improvement as quick as we can, and wherever it is possible.

2. There are those which arise from want of legislation, and from an unsound sentiment in respect to the railroad.

3. There are others which arise from imperfect structure, from want of care, and from mismanagement.

1. In this State, we authorise the construction of railroads, wherever they can by any means be made, without any limit or restriction as to height of grade, as to curvature, as to speed, as to weight of engines or trains, or as to track.

A railroad that is *straight* and *level*, and is well laid with *double tracks*, and is built upon *capital*, and that costs with its motive power and appurtenances, from seventy-five to one hundred thousand dollars per mile, will, in all probability, be very free from accident.

This rate of cost, great as it seems, is not half the cost of railroads in Europe.

We build them here, with grades of 50, 75, and 100 feet rise to the mile, with curves of very small radii, with single track, of course with heavy engines to surmount such grades, and then to meet the public demand for high speed, we run them 30 or 40 miles an hour.

To be very safe, the railroad should always be of double track, if trains are to be run upon it at high speed, and more than one way at the same time. Yet we have not the means to make them of double track in this country, and very many routes will not justify it.

The entire structure of a railroad should be thoroughly complete before passengers are carried upon it; yet the public here, would be restless, to be excluded, after it is possible to run over it.

The proportion of accidents is greater upon new roads than upon old ones; because they are constrained to be opened before they are really ready, or from lack of capital, are unable to construct them as they should be made.

It is very obvious, that heavy trains cannot as safely be run down steep grades and around sharp curves, as upon level and straight lines.

Yet, extensive as our country is, we must have such railroads, and with them, must expect the hazards which are necessarily incident.

The occurrence of sleet or frost, upon such roads, at particular points, may sometimes render human control of a train powerless.

Our severe winters, often cause the breaking of an axle, a rail, or a wheel; and this is most likely to occur on the severe grades or sharp curves of railroads, which our necessities require to have made, and which the Legislature authorizes.

This is a class of accident which arises from the authority to make railroads, where there seems to be a great necessity for them, but where they must, of course, be subject to hazard.

2. The accidents which arise from want of legislation, and from unsound sentiment in regard to the railroad, so far as my experience enables me to judge, are of far the most numerous class.

Many more people are hurt or killed, from walking and being upon the railroad, than from all other causes. In the reports of this company for some years back, this has been urged as an important matter. Persons not connected with the company, should never allow themselves, or be allowed, to walk, or be upon the railroad. It will be no more than kindness to them, to prohibit this by severe penal enactments. In England, all persons are rigidly prosecuted for going upon the railway tracks. Here, all persons claim the right to travel upon them. During the last session of the Legislature, a bill upon this subject, at the suggestion of the undersigned, was introduced into the Assembly. It was met by a proposition, to require the railroad companies to make a foot-path along their tracks. It is scarcely possible to suggest stronger evidence of unsound sentiment in respect to the railroad than this.

Within three years past we have killed, upon the tracks of this company, nineteen persons, who were improperly thereon.

This great destruction of life goes on, because we cannot keep people off the tracks.

We have put up signs the whole length of the railroad, to caution, all persons against it; still it seems to do no good. We dare not drive them off for fear of injury. This is cited as an evidence of unsound sentiment.

There is, in my judgment, no legislation more immediately necessary, than the proper provisions to prevent all persons disconnected with the railroads, from walking and being upon the tracks.

There is another class of accident often resulting in personal injury, which is the effect of want of discipline, or unwillingness to submit to it, on the part of passengers.

Passengers will not keep their seats; they expose their safety by standing upon the platforms of cars; by getting on and off the trains when in motion; by exposing themselves upon the tracks when trains are approaching; by riding upon the engines and baggage cars. The rules of most companies, doubtless, forbid this; still there are from these causes, I think, more personal injuries to *passengers* in our State, than from all others. They are often very unwilling to submit to the discipline necessary to their safety. The government of a railway train should be firm, strict, and absolute in its managers; yet the attempt to enforce such discipline, is very often followed by restlessness and complaint on the part of passengers. There is still another class of accident of similar character; this occurs at road crossings. Signs are put up generally, that are conspicuous; bells are rung, or the steam whistle sounded on approaching road crossings, yet the attempt is very often made to cross roads before an approaching train. There is great error in the public practice in this respect. The velocity of a train at high speed, cannot be properly estimated. The train cannot be stopped or checked at every road crossing; if it is, then the rate of speed will be so reduced, as that the usefulness of the railroad will be essentially impaired. There is a claim often set up, that any traveller upon the common highway, has the same right to its use at the same moment, as the railway trains have. The exercise of only reasonable care by those using the common road, at the crossing, will always save from accident. Litigation as to this right of crossing, often ensues, and it quite generally results against the railroad company, because this seems to be the tendency of public sentiment. As we must have railroads, and as they must be run at high speed, it would be far better to encourage in the community a just appreciation of all proper considerations. This kind of accident will certainly continue, until more care is exercised by those crossing the tracks of railroads; such care will be more likely to be exercised, if a just sentiment is entertained by the community generally.

Another class of accident that very frequently occurs, arises from cattle and other domestic animals straying upon the track. This is considered a very important matter, and subsequent experience fully confirms the suggestion upon this subject, made in the annual report of this company, for the year 1850. I cannot more fully present the matter, than is contained in the following extract from that report:

One cause of accident, it is believed, is in the power of the Legislature to remove. It is well known that cattle are often run over upon the tracks, and the trains are thereby thrown off. They will stray upon the road. They stand in the crossing of public roads; they either will not get out of the way or they very often go, deliberately, in front of the engine. Where every precaution is taken by the company they will get upon the tracks. This results from their being allowed to run at large. It is not possible to fence against them. It is not unfrequent that they are found upon the tracks, at night, where the owners of adjacent lands have been fully paid for making and maintaining fences, they neglect to build them. Whenever cattle are killed the owner presents his claim for them, and it is quite generally found to be better to submit, and pay for them, rather than to contest the question before a local tribunal. This really, only increases the dificulty and makes the owner unmindful of taking proper care of his cattle. The ground is assumed by the owners of cattle, that their animals have as good right to occupy a public highway at a railroad crossing, at the same moment when a train of passengers are passing them, that they have. If this is to be maintained it will be seen at once that a very serious obstacle is interposed to safe and rapid travelling. In Massachusetts, the owners of animals may not allow them to run at large, without incurring a penalty. Hence there is far less of this kind of accident there. If the like provision was adopted here, travellers would be more safe.

I believe that under the two foregoing heads, the most common cases of accident have been alluded to, and their true causes stated. Proper legislation will help to establish sound public sentiment, upon all these matters, and then there will be far less hazard upon the railway, and we shall learn to sustain it, as one of the great and useful improvements of the age.

3. The accidents from imperfect structure, and from want of care, and from mismanagement, are most likely to occur upon new roads, because they are first tested when they come into

actual use, and because their management has to be learned as a practical working system.

There may be defects in the plan or execution of bridges, tressle work, &c. Here again the item of want of capital comes in. We desire to get along as well as we can with the means we possess, and hence have not the ability on all roads to build the most stable bridges, and the most perfect structure. If it was provided by law, that before any railroad was opened for public use, the State Engineer should examine the structures upon it, and give a certificate of fitness, there would be better assurance that the roads will hereafter be perfectly constructed.

A large portion of the service upon railroads is purely mechanical. It is quite common to see or hear the remark, that men should be better paid, and then there would be better service. As a general rule, I think that the men are better paid upon railroads, than for any other equivalent service. Hence employment is sought all over the country. The managers seek to employ the best men. Sometimes they are mistaken in their selections,—sometimes they must employ new men, and these not having the experience for emergency, make mistakes.

It is a business to be learned by practice and by discipline. The operatives, who are the most successful, and those who have learned their duties mechanically, and who having little variety of employment, can, therefore, do their respective duties in the best manner.

Upon a single track road, over which much business is transacted, the construction of the switch, and the management of it, are very important matters. This is often changed,—sometimes inadvertantly, at others from design to do injury, and again left wrong by negligence.

Until we have all double track railroads, we shall be liable in some degree to these hazards. They will be less and less in proportion as the roads are longer used, and the men employed become more skilled in their business. It is not reasonable to expect that new men can be as safe as those who have become familiar with the business by long practice.

Whenever accident does occur to a train, those engaged in its management are most likely to be injured. They know the hazard in proportion as they have learned the business, and they will, by the exercise of their skill and judgment, endeavor to guard their own lives, and their limbs, which to them are almost as important.

When, however, *their* misconduct is the cause of injury to passengers, or when they disobey the prudent regulations made for their guidance, then they should be personally liable to such penal provisions as may be deemed necessary to insure care and obedience.

The public constantly expects increased speed upon the railroads, and this expectation is stimulated by the press, and by competition. If we could be contented with a speed of twenty miles an hour, and if the roads are well constructed, that rate can be accomplished with but small liability to accident.

The tendency, however, is in a contrary direction; higher speed is constantly demanded, and this, with the stimulous of rivalry, and the imperfect character of roads, in some degree, increases the liability to accident. The accidents arising from the failure of wheels and axles upon the engine and cars, though not of frequent occurrence, are those most difficult to guard against. It is not possible always to detect incipient fracture in these parts of the rolling stock. I think that great care and much thought is bestowed by those having the charge of railroads, in the procuring of the best axles and wheels that they can obtain. The size and strength of them have been increased, and the best forms for safety have been sought. Still they will sometimes fail. We have used wrought wheels at a cost of three times that of the cast wheel. There are however objections to these. The flange wears sharp, and there is then danger that it will catch upon the rail, and thus throw the car off the track, and on the whole, it is by no means certain, that they are better than the cast wheel, though the popular sentiment might favor them. We use safety beams by which the axle is held up in its place, it a wheel or journal breaks, and thus guard against injury as far as possible. These ought generally to be used. But I repeat iron, will sometimes break suddenly, and I do not believe that any scrutiny can always prevent it. Passengers do not like to change cars often, hence there is a tendency, in order accommodate them, to run the cars as long distances as practicable. While the convenience of the passengers, and perhaps economy is favored in this arrangement, it is in some degree less safe, than if more frequent changes were made, whereby there can be more supervision of the cars, and less service of them, and of course, less liability to accident. This is a point which will hereafter engage more attention than is now given to it.

Our cars are heavier, and each carry more passengers in number, and more weight of property, than those of other countries, so that the dead weight of our trains, is much greater in proportion to the paying load. In order to afford equal accommodotion to all passengers, we use large or 8 wheel cars. These are of necessity very heavy, always exceeding the weight of their load. Our passengers carry, perhaps, more baggage than any other people, as goods and merchandize are very commonly carried in their trunks claimed to be their baggage. We are not strict to limit the weight of baggage, and to charge for over weight From all these causes while our roads are not as straight, level and as well constructed, as in other countries, we actually put greater weight upon them, and expect and do receive more service, and for generally less compensation.

Collisions, or the running together of trains, occur upon all roads, and they probably will never entirely cease, any more than vessels will cease to run into each other, or waggons to run together; still I think this kind of accident will not be as frequent as heretofore. They occur most frequently upon single track railroads, but they are by no means confined to them. There is the greatest care necessary upon double track roads to prevent one train running into another ahead of it.

Of course this accident must always arise, from the fact, that one of the trains is out of time. There are so many causes to throw them out of time, that rules are generally prescribed for the government of trains so situated. Something may occur to the engine, or to the cars, or to some passenger, to cause a loss of time; or a flood, or frost, or wind, or some other circumstance may so delay a train, that it cannot reach a place of meeting in season, and they must, therefore, be very often out of their time. There is no safety, but to follow the rules which are provided in such cases. Passengers, where they greatly desire to advance in their journeys, will sometimes interfere, and urge conductors and engineers to go on, in violation of rules.

There is no so safe way, as to leave this matter to the wise and prudent regulation of the managers of the railroads, who having knowledge of all the circumstances, can best provide for emergency.

All the matters alluded to, severally and combined, have much weight upon the proper understanding of the subject.

We cannot compel the construction of double tracks upon all our railroads. We cannot limit the speed to a low, and therefore, entirely safe rate of travel. We cannot raise the amount of money, in the construction of our railroads, necessary to make the most thorough and perfect works. These are all esssential for the most complete safety.

There is a mutuality of interest between the public and the railroad company, and when all their relations and duties are well considered, there cannot fail to be such improvements, as will insure a progressive exemption from accident.

Very respectfully,

JOHN WILKINSON.

(A 1.)

Office of the Northern Railroad Co.
Malone, *October* 15, 1852.

Gentlemen—I have had the honor to receive a copy of certain resolutions adopted, and of interrogatories propounded by you to the several railroad corporations in this State, in pursuance of a resolution of the Senate, adopted April 15, 1852.

I beg leave herewith to submit replies on the part of this corporation, to those interrogatories.

Respectfully, your ob't. servant,
CHARLES L. SCHLATTER,
Superintendent.

To Messrs. W. J. McAlpine, *State Engineer and Surveyor.*
Henry E. Bartlett, *Chairman*, &c.,
Committee.

NORTHERN RAILROAD.

Reply to interrogatories propounded by the State Engineer and Surveyor, and the chairman of the standing committee on railroads of the Senate, of the State of New-York.

1. ACCIDENTS.

Reply to the first interrogatory.

The first accident which occurred on the Northern railroad, after the annual report of September 30, 1851, took place at Malone, on the 13th day of November, 1851.

As the *way freight train* going west, approached the station, two men, both intoxicated, clambered upon a platform car; one of the men lost his balance and fell upon the track, and was killed by a car passing over him.

Reply to the second interrogatory.

On the 17th November, 1851, the switchman at Bangor station, switched the down freight train from the main to the side track, a short time previous to the time of the arrival of the up freight, and jumped on the last car to ride to the road crossing, near the station ; on his way to dinner, *he forgot to turn the switch back to the main track*. The through freight train, going west, passes Bangor station without stopping. The rail was iced over, and the brakes filled with ice and snow. The engineman, (one of the best on the road,) saw the switch was turned wrong, when more than a quarter of a mile from it. He whistled "down brakes," and finding his speed was not sufficiently diminished, reversed his engine. But the state of the rail and brakes, on account of ice, permitted the train to move forward. The grade is also descending at this station, and the force of a heavy train on the slippery rail, drove the engine and five cars off the switch, and over an embankment five feet in height. The speed at which the train was moving when the engine finally passed of the switch, has been estimated at from three to five miles per hour. The engineman, conductor, and four brakemen, jumped off the train. The fireman and brakeman on the first car, remained at their post. The fireman escaped without injury; the brakeman was precipitated from the top of the car into a ditch, which was frozen over, in water about three feet deep; it is supposed that he was stunned or chilled by the water, for when taken out, although no injury was perceptible on his person, he was dead. The switchman had been at the same post from the first operations of the road, and was considered one of the most careful men on the line. He disappeared soon after the accident, and has not been employed since. Damage to the company, $780.

December, 1851.—As the down freight train approached Chrystal Brook, in the town of Ellenburgh, a wheel of one of the cars broke and threw the other wheels from the rail. In passing the trestle bridge over the brook, some of the plank were broken through and the rails thrown apart; the trucks on the car mentioned, dropped through the bridge, and as other cars came up five sets of trucks fell through before the train could be stopped. Fortunately no one was hurt, and the width of the bridge prevented the cars from falling off. Damage $525.00.

April 29, 1852.—A laborer in a gravel pit, whilst riding upon a gravel car, fell between the cars and was killed.

May 12, 1852.—The through freight train leaving Ogdensburgh at 4 o'clock A. M., was followed by an extra freight train, leaving 25 minutes after the departure of the regular train. The morning was dark and a slight fog prevented objects being seen at much distance. The first train stopped at Lisbon 8½ miles from Ogdensburgh, to take water, as usual. The following train ran into the leading one with such force as that the tender lapped over the foot board of the engine, throwing the wood against the engineman, and fastening him against the head of the boiler, burning and otherwise injuring him so severely that he died in a few days. The expense attending the care of the engineman, while living, and the transportation of his body to his friends in Vermont, together with the repairs of engine and cars, amounted to about $300.

May 13, 1852. A man was found dead upon the track between Malone and Bangor stations. The night freight trains had passed over him. He had been intoxicated the day before, and a tin can which had liquor in it was found with him.

May, 1452. A heavy night rain caused a cattle guard, in Chazy, to be underminded. The engine of the night freight train, going east, passed over in safety, but its passage had so weakened the rail that the cars broke it down. Several cars were broken, and a portion of their contents (wheat,) spilled. Damage to cars $1600. No one was injured.

June 26, 1852. A child about two and a half years old, sat on the track at a road crossing near Lisbon station, when the wood-train ran against and killed it. The child was not seen in time to stop the train, being partly concealed by the fence connected with the cattle guard.

Sept. 25, 1852. A passenger train ran over two cows, near Ogdensburgh station. The proprietors of the adjoining land ha taken down the fence, and the cows were concealed behind some cars standing upon a spare track, until, being freightened by the approaching train, they jumped upon the track, throwing off the tender and baggage car. No one was hurt; damage trifling.

Reply to the third Interrogatory.

The number of domestic animals killed or injured, so far as known, is 21. Of these, 16 have been, or are to be paid for, at the following prices, respectively, viz: $10, $12, $25, $25, $10, $6, $10, $8, $8, $22, $15, $122.11 $6, $16, $7.90, $17.50.

Reply to the fourth Interrogatory.

The first great precaution I take for the prevention of accidents is a *rigid enforcement* of the rules and regulations, and to the written orders given from time to time, as they may be required by the particular exigencies of the service. A prompt dismissal from the service of the company, of any employee violating a rule, whether such violation is attended by an accident or not, is indispensibly necessary to the maintenance of such dicipline as is consistent with the safe management of a railway. The dismissal from service of men who may have been employed for years, and who by faithfulness and experience, may have earned the confidence of their superiors, is an unpleasant and painful duty; especially when the neglect which makes it necessary, was not of a nature to imply wilful or malicious disobedience; but the important matter of a thorough and reliable discipline, upon which depend the lives and property of so many persons, will not permit any hesitation. A violation of rules *must be* followed by the dismissal of the guilty party, and that promptly, and finally. And it must be understood that there is not a man whose services cannot be dispensed with at a moment's notice.

The signals at switches are placed at from ten to fifteen feet above the rail, according to the position of the switches. This is simply an adaptation of the semaphore or old fashioned arm telegraph to the switch of a railway. This can be seen at a great distance, and has the advantage in the yards, and at stations, of being easily observed above the tops of the cars.

For the regulation and running of trains, when out of time, I have adopted the plan of giving certain trains precedence over others. By this system, a train being at a place of meeting, and the time having expired without the arrival of the other train, the conductor of the train in waiting, knows whether it is safe for him to take the track, or whether the approaching train has precedence. It sometimes happens, that a train having the right of the track, gets out of order, so as to occasion delay to other trains, but in the experience of this road, the instances have been few, and the evil unimportant. The telegraph is seldom used to direct a train, and indeed there has been but slight occasion for it. Our trains run, and meet, with great regularity, and except in particular emergencies, I prefer the slight inconvenience of delay, to the danger of colission. The accompanying time table contains all the rules and regulations for the running of the road. They are the same with which I commenced its operation, and I have had occasion to make only such unimportant modifications as are rendered necessary by the precedence required, by certain trains, at particular seasons of the year, or in consequence of the adoption of certain hours of arrival and departure. With these regulations, these have been in constant daily operation all through the season. Eight regular through freight trains, four passenger trains, two irregular lumber and wood trains, and four gravel trains, on a single track, 118 miles in length; all the trains coming in, upon time, with great regularity.

The locomotives, tenders and cars, are examined by the train hands at Brush's Mills, a station about midway the road, and again upon arrival at either terminus, under the direction of the master machinist at one end, and that of the foreman of the repairs shop, at the other. Neither cars nor engine, are allowed to go upon the road unless in perfect running order, and wheels are taken off if the slightest crack is discovered. Cast iron wheels do not stand the winters of this high northern latitude, and I am about substituting wrought wheels for winter use on the engines and tenders, and on passengers cars. But little trouble is experienced from the breakage of wheels in summer.

The road master and his assistants examine the road very carefully, and inspect also the culverts, bridges, rails, and other parts of the road, and keep every part in repair. In addition to which, an inspector of bridges and water stations is employed, whose duty it is to see that every thing under his charge is kept in perfect order, and who reports to me every week its condition.

Answer to the fifth interrogatory.

No precautions other than those required by law, have been adopted to prevent accidents at street and road crossings. Every care is taken, however, to have those which the law does require strictly complied with; for this purpose, posts are set up 80 rods from the road crossings on the side of the fireman, with the letter R for "ring" or B for "blow" plainly painted upon them in large characters, and a strict attention to the requirement of the law in this respect is enforced.

Answer to the sixth interrogatory.

The number and duties of each class of persons employed in the management of the road, not including those employed in construction, and the wages per month or year paid the same, are set forth in the following table.

No.	CLASS.	DUTIES.	WAGES PER DAY,	PER MO.	PER YR.
1	Road Master,	Has charge of repairs of track,.........			$900.00
1	Master Machinist,	Has charge of engines and cars,.........			1,200.00
2	Section Masters,	Repair track,..........................		$45.00	
13	do	do.		40.00	
1	Inspector of bridges,	Has charge of bridges and water stations, ...	$2.00		
18	Switchmen,...................................		.80 to 1.00		
4	Conductor,	of Passsenger Trains,.....		50.00	
8	do	of Freight Trains, ...		40.00	
1	do	of Wood Train,..........		45.00	
1	do	of Lumber Train,.........	1.75		
44	Brakemen,	of Pass. and Freight Trains,	1.00		
27	Engineers,..		2.00 to	60.00	
27	Firemen,..		1.00 to	30.00	
19	Station Agents,	Have charge of Stations, and are local Agents,..........................			300 to 1,000.00

The section masters have from 2 to 4 men under their charge, the number depending partly upon the season, whose pay varies from 75 cts. to $1,12½ per day.

The engineer and firemen are attached to their respective engines, which are sometimes employed in construction. They are also required to assist in repairing their engines when in the shop for that purpose. Usually, 16 enginemen, and as many firemen, are employed in operating the road for freight and passengers, including those employed at the terminus in switching and making up trains.

Reply to the seventh interrogatory.

The shortest period of time between the starting of trains from any station on the road, is fifteen minutes.

2. CHARACTERISTICS OF THE ROAD.

Answer to the first interrogatory.

The following table will show, consecutively, the length of each grade line, its elevation above tide, and grade in feet per mile.

Reply to the third interrogatory.

The weight of the rail per lineal yard, used on this road, is 59 to 60 lbs.

Reply to the fourth interrogatory.

The dimensions of the cross-ties on this road are not less than 7 feet in length, 7 inches thick, and 9 inches in lateral breadth; and their distance apart from centre to centre, is two feet seven inches.

Reply to the fifth interrogatory.

The number of road and street crossings on a level with the rail, is 83: the number above is 9, and the number below the line of grade is 8.

Reply to the sixth interrogatory.

The number of switches on this road is 140, which includes switches put in for gravel tracks, which will be discontinued when the material is no longer wanted.

At each station there are at least two switches on the main track, both under charge of the same switchman. The switcher at the junction, with gravel tracks, are under charge of switchmen who have no other duty assigned them. In the yards at Ogdensburgh and Rouse's Point, a single switchman takes care of several switches, the number depending upon the frequency of their use.

At stations where the duty of the switchman as such, does not require him at the switch, except at long intervals, he is employed in assisting to handle freight. The switch, however, has his first care; and at stations where they are often wanted at the switch, they have no other duty.

Reply to the seventh interrogatory.

The whole road has been fenced by the company.

Reply to the eighth interrogatory.

The space clear of all obstructions "between the sides of the car and the side of bridges, tunnels and rock cuttings," is not less than four feet. The cast iron columns of water cranes, where such are used, approach to the distance of twenty inches.

Reply to the ninth interrogatory.

The reply to this interrogatory is furnished by the following table. The engines are used on all parts of the road, indiscriminately, except the two employed in switching, and these are stationed at Rouse's Point and Ogdensburgh, respectively.

TABLE

Showing the working, &c., of Locomotives from the opening of the Northern Railroad, October 1, 1850, *to June* 1, 1852.

Number.	Names of engines.	Where manufactured.	SIZE.				TONS WEIGHT.				CONSUMED.					REPAIRS AND RENEWALS.				
			No. pairs driving wheels.	Diameter driving wheels	Pairs of trucks.	Size of Cylinder.	Of engine, with wood, water and crew.	On driving wheels.	Of tender.	Of engine and tender equipped for use.	Cords of Wood.	Gallons of oil.	Pounds of tallow.	Pounds of waste.	Cost of wood, oil, tallow and waste.	New tires on eng.	Tires turned off	New truck and tender wheels.	Cost for labor and materials. Extra-ordinary.	Cost for labor and materials. Ordinary.
				ft. in.																
1	Sorel, ...	Amoskeag Works,..	2	6.2	1	16 × 20	23.77	15.06	16.05	39.82	578	164¼	197	177	$1, 356 05	0	4	6	....	$848 89
2	Richelieu,...	Taunton Works,...	2	5.6	1	15 × 20	23.68	15.30	12.65	36.53	630	170	196	166	1, 466 06	0	4	8	....	1, 215 15
3	Rideau, ...	Essex Co. Works,..	2	5.6	1	16 × 20	25.80	16.80	15.50	41.30	79	25	5	32	185 45	0	0	0	....	347 33
4	Oswegatchie,.	Boston Loc. Works,	2	5.6	1	15 × 18	21.52	13.20	15.01	36.53	926	322	244	300	2, 275 20	4	8	20	....	2, 036 09
5	Deer, ...	Kirk, ...	2	5.8	1	16 × 20	25.35	16.25	14.25	39.60	555	148	73	158	1, 286 51	4	4	0	....	1, 809 06
6	Trent, ...	Essex Co. Works,..	2	5.0	1	15 × 18	20.50	13.50	15.11	35.61	320	107	17	73	736 66	0	4	6	$136 54	427 47
7	Welland,....	Essex Co. Works,..	2	5.0	1	15 × 18	24.90	15.15	13.35	38.25	534	188	54	160	1, 242 28	4	4	5	161 28	1, 180 63
8	Ottawa,.....	Taunton Works, ...	2	5.0	1	15 × 18	21.75	13.35	12.51	34.26	708	186	62	240	1, 639 78	8	8	8	....	1, 844 10
9	Ontario,.....	Globe Works, ...	2	5.0	1	15 × 20	22.85	14.77	15.00	37.85	1, 259	330	127	351	2, 881 32	6	20	26	....	2, 051 88
10	Ausable, ...	Boston Loc. Works,	2	5.0	1	15 × 18	20.50	13.50	15.11	35.61	1, 274	350	59	327	2, 909 85	4	16	30	....	2, 206 72
11	Saranac, ...	do do	2	5.0	1	15 × 18	20.50	13.50	15.11	35.61	1, 274	403	88	400	2, 982 84	4	4	14	....	1, 357 62
12	La Grasse, ..	do do	2	5.0	1	15 × 18	20.50	13.50	15.11	35.61	1, 090	301	84	281	2, 530 68	0	4	18	150 00	983 36
13	Chateaugay,.	do do	2	5.0	1	14 × 18	17.35	11.20	12.50	29.85	945	233	160	315	2, 169 50	0	8	8	....	1, 341 73
14	Niagara, ...	Essex Co. Works,..	2	4.6	1	15 × 24	26.20	17.10	15.55	41.75	94	50	5⅛	21	219 98	0	0	0	....	125 85
15	Michigan, ...	do do	2	4.6	1	15 × 24	26.10	17.15	15.70	41.80	100	28	3⅛	27	230 46	0	0	0	....	149 99
16	Raquette, ...	Boston Loc. Works.	2	4.6	1	16 × 20	23.41	14.98	14.03	37.44	935	230	105	211	2, 115 90	4	4	8	....	1, 586 07
17	Erie, ...	do do	2	4.6	1	16 × 20	23.41	14.98	14.03	37.44	823	231	216	179	1, 916 19	4	4	12	....	1, 573 25
18	Superior,....	Globe Works, ...	2	4.6	1	16 × 20	22.20	13.90	13.13	35.33	640	199	36	134	1, 482 62	0	4	4	....	627 69
19	Genesee, ...	Essex Co. Works,..	2	4.6	1	15 × 20	24.88	15.65	13.35	38.23	502	123	45	107	1, 113 75	5	4	0	....	400 82

20	St. Clair, …	Essex Co. Works,..	2	4.6	1	15 × 20	24.32	15.32	13.30	37.62	490	146	85	112	1,108 81	4	4	4	....	856 75
21	Huron,.....	do do	2	4.6	1	15 × 20	24.88	15.65	13.35	38.23	314	100	11	76	715 20	0	8	0	257 43	315 98
22	St. Lawrence,	Boston Loc. Works,	2	4.6	1	16 × 20	22.40	14.90	15.11	37.51	1,064	203	141	251	2,388 14	8	8	6	150 00	2,041 73
23	St. Regis, …	do do	2	4.6	1	16 × 20	22.40	14.90	15.11	37.51	1,257	291	56	261	2,845 94	8	8	8	209 80	1,809 13
24	Champlain,..	do do	2	4.6	1	15 × 20	19.75	12.33	15.21	34.96	1,551	295	172	449	3,434 65	5	16	4	....	1,403 19
25	Salmon,.....	do do	2	4.0	0	14 × 20	17.25	17.25	12.50	29.75	1,128	236	209	398	2,548 26	5	8	2	....	1,206 29
26	Little Salmon	do do	2	4.0	0	11½×20	13.80	13.80	7.75	21.55	584	189	165	245	1,393 44	4	8	0	....	991 80
27	Little Trout,	do do	2	4.0	0	11½×20	13.80	13.80	7.75	21.55	505	136	68	235	1,167 81	4	8	0	....	640 43
28	Chazy, ...	Hinckley & Drury,.	1	4.6	1	11½×20	....	....	....	....	419	78	100	187	963 93	..	..	..	....	518 99
																				32,963 04
																Average cost per mile, run for renewals and repairs, ...				$5^{\underline{22}}$

TABLE—(CONTINUED.)

Number.	Names of engines.	Where manufactured.	Wages, engine and fireman.	When first placed on the road.	How employed.	Miles run by engines.	TOTAL COST.		Remarks.
							Including repairs, wood, oil, tallow, waste, and engine and fireman's wages.	Per mile run.	
1	Sorel, ...	Amoskeag Works, ..	$781 92	April, 1851, ..	Passenger train, ...	27, 020	$2, 986 86	11.05	Good condition.
2	Richelieu, ...	Taunton Works, ...	769 25	do	do do	26, 071	3, 450 46	13.23	do
3	Rideau, ...	Essex Co. Works, ..	107 70	Dec. 1851, ..	do do	3, 360	640 48	19.06	do
4	Oswegatchie, .	Boston Loc. Works,	1, 144 18	April, 1850, ..	do do	38, 414	5, 455 47	14.20	do
5	Deer, ...	Kirk, ...	549 19	May, 1850, ..	Passenger and wood, ..	14, 486	3, 644 76	25.16	Rebuilding.
6	Trent, ...	Essex Co. Work, ...	359 82	Aug. 1851, ..	Freight, ...	11, 230	1, 660 49	14.78	Good condition.
7	Welland, ...	Essex Co. Works, ..	667 60	July, 1851, ..	Passenger and freight, .	20, 168	3, 251 79	16.12	do
8	Ottawa, ...	Taunton Works, ...	870 14	Nov. 1850, ..	Material and switching,	20, 447	4, 354 02	21.29	do, 2d hand of Norfolk Co.
9	Ontario, ...	Globe Works, ...	1, 399 05	Oct. 1850, ..	Passenger and freight, .	45, 716	6, 332 25	13.85	Good condition. [R. R.
10	Ausable, ...	Boston Loc. Works, .	1, 430 69	do	do do	45, 716	6. 547 26	14.32	do
11	Saranac, ...	do do	1, 359 30	Aug. 1850, ..	Freight and wood, ...	39, 316	5, 699 76	14.49	do
12	La Grasse, ..	do do	1, 230 58	Sept. 1850, ..	Passenger and freight, .	35, 743	4, 894 62	13.69	do
13	Chateaugay, .	do do	1, 041 61	Nov. 1849, ..	Gravel, ...	21, 303	4, 552 84	21.37	do
14	Niagara, ...	Essex Co. Works, ..	88 98	Feb. 1852, ..	Freight, ...	2, 700	434 81	16.10	do
15	Michigan, ...	do do	90 00	Mar. 1852, ..	do	3, 124	470 45	15.06	do
16	Raquette, ...	Boston Loc. Works, .	941 46	April, 1851, ..	do	31, 932	4, 643 43	14.54	do
17	Erie, ...	do do	859 04	do	do	26, 850	4, 348 48	16.19	do
18	Superior, ...	Globe Works, ...	583 97	May, 1851, ..	do	20, 795	2, 693 28	12.95	Wants some repairs.
19	Genesee, ...	Essex Co. Works, ..	497 00	ct 1851, ..	do	16, 694	2, 011 57	12.05	Good condition.
20	St. Clair, ...	do do	463 61	do	do	15, 060	2, 429 17	16.13	do

21	Huron, ...	Essex Co. Works,..	321 01	Sept. 1851,..	Freight,..............	9, 695	1, 609 62	16.60	Good condition.
22	St. Lawrence,	Boston Loc. Works,	800 85	Oct. 1849,..	Gravel and ballast,....	18, 198	5, 380 72	29.56	do
23	St. Regis, ...	do do	1, 163 11	Oct. 1850,..	do do	28, 323	6, 027 98	21.28	Wants repairing
24	Champlain, ..	do do	1, 495 48	Nov. 1849,..	do do	30, 873	6, 333 32	20.51	do
25	Salmon, ...	do do	1, 331 30	May, 1850,..	do do	27, 506	5, 085 85	18.49	do
26	Little Salmon	do do	1, 239 48	Dec. 1849,..	Switching, ...	20, 345	3, 624 72	17.81	Good condition.
27	Little Trout,.	do do	1, 282 31	May, 1850,..	do	15, 928	3, 090 55	19.40	do
28	Chazy, ...	Hinckley & Drury,	830 89	Oct. 1849,..	Ballast and material,..	14, 541	2, 313 81	15.91	Wants some repairs, 2nd hand of old Colony Railroad Company.
						631, 607	$103, 968 82		
							Total average,..	16.27	

CHARLES L. SCHLATTER,
Chief Engineer and Sup't.

Names of Engines.	Tons weight of engine and tender equipped for use.	How employed.
Sorel,	39.82	Passenger train,
Richelieu,	36.53	do do
Rideau,	41.30	do do
Oswegatchie,	36.53	do do
Deer,	39.60	Passenger and wood,
Trent,	35.61	Freight,
Welland,	38.25	Passenger and freight,
Ottawa,	34.26	Material and Switching,
Ontario,	37.85	Passenger and freight,
Ausable,	35.61	do do
Saranac,	35.61	Freight and wood,
La Grasse,	35.61	Passenger and freight,
Chateaugay,	29.85	Gravel,
Niagara,	41.75	Freight,
Michigan,	41.80	do
Raquette,	37.44	do
Erie,	37.44	do
Superior,	35.33	do
Genesee,	38.23	do
St. Clair,	37.02	do
Huron,	38.23	do
St. Lawrence,	37.51	Gravel and ballast,
St. Regis,	37.51	do do
Champlain,	34.96	do do
Salmon,	29.75	do do
Little Salmon,	21.55	Switching,
Little Trout,	21.55	do
Chazy,	....	Ballast and material.

Reply to the tenth interrogatory.

The maximum weight of passenger cars is............10 tons.
" " " freight " .... 7 tons.
" " " baggage " .... 9 tons.

The weight usually put into a freight car, is ten tons. This is sometimes exceeded, but not more than twelve tons is ever allowed in a freight car, with the knowledge of the agent; one hundred bbls. flour is a common load, which is nearly equal to eleven tons. The greatest number of cars in a train, is thirty loaded, or fifty empty cars, of eight wheels each.

Reply to the eleventh interrogatory.

The least diameter of the axles of passenger and freight cars, is four inches, and of the journals of the same, three and seven-eighth inches.

Reply to the twelfth interrogatory.

We have no safety beams under our cars.

Reply to the thirteenth interrogatory.

The maximum running speed of the express trains, by the time tables, is 35 miles per hour. When detained from any cause, this speed is frequently exceeded, and between stations, from 50 to 65 miles per hour has been reached.

Reply to the fourteenth interrogatory.

On passenger trains, we have a brakeman to each car. On freight trains, one brakeman to each five cars.

Reply to the fifteenth interrogatory.

The engines and cars are run regularly once each day, over the whole length of the road—118 miles. At Brush's Mills, near the middle of the road, the engine is carefully examined by the engineman and fireman; and the cars are in like manner examined by the brakeman. Ten minutes are allowed for this examination. Examination is also made when taking wood and water. On arrival at the terminus, which is the end of the day's trip, a thorough inspection is made, under direction of the master machinist, at Rouse's Point, or of the foreman of the shop, at Ogdensburgh.

(A. 4.)

UTICA AND SCHENECTADY R. R. OFFICE,
Schenectady, December, 1852.

The following reply to interrogatories addressed to this company by the State Engineer and Surveyor, and the chairman of the standing committee on railroads, of the Senate of the State of New York, is respectfully submitted.

1st ACCIDENTS.

Reply to the first interrogatory.

The first accident on this road after the annual report to the State Engineer and Surveyor, of the 30th September, 1851, occurred about one mile east of the village of Fonda, on the 2d of January 1852, by which one man who was lying upon the track intoxicated, was run over by a freight train and killed.

This took place on a curve in the road. He was not discovered by the engineer in time to prevent the accident.

Reply to the second interrogatory.

The second accident occurred on the 12th of January 1852, by which the brakeman on a freight train was killed, by coming in contact with a bridge about three miles east of Utica. He was acting in violation of the rules, and had been repeatedly cautioned against standing on the top of the cars.

On the 5th of April, 1852, at night, a man was run over on the track by the express train, about one mile east of Spraker's, and killed. He was intoxicated, and was previously warned not to walk upon the track. He was not seen by the engineer.

On the 10th of April, 1852, the conductor of a freight train was killed, about six miles east of Utica. A few minutes previ ous to the occurrence, he informed the engineer that he was going back to take up the bell cord, (which was a direct violation of the instructions) and is supposed to have fallen between the tender and cars.

Reply to the third interrogatory.

The company has paid ($1,120.50,) one thousand one hundred and twenty dollars, and fifty cents, for 64 domestic animals killed on the road, viz. 9 horses, 1 ox, 30 cows, and 24 hogs. Claims for a large number, in addition to the above, have been made, for which the company have declined to pay.

Reply to the fourth interrogatory.

The principle precaution taken to prevent the occurrence of accidents, is a positive enforcement of the following instructions, for any violation of which no apology is received.

1. All trains going west, will run upon the north track, and all trains coming east will run upon the south track, according to time table.

2. Conductors of trains, and engineers, must compare their watches daily, with the office time at Schenectady, which will be the standard time.

3. No train must arrive at a regular station in advance of the time specified in time table; and freight and working trains must give a clear track to passenger trains on the road and at stations. Freight trains must not be run over fifteen miles per hour, nor must they leave a station less than twenty minutes in advance of the time of arrival of a passenger train. Trains leaving behind time, shall not be run at a greater speed than allowed by time table—(that is, no time shall be made up, unless lost upon the road,) except by special direction.

4 If a train breaks down, or stops between stations, a man must be sent back immediately, at least eighty rods, with a flag in the day time, and a lamp in the night time, to warn approaching trains.

5. Whenever an extra train, or engine, is following another, in the day time, a flag must be carried upon the forward engine;

and in the night time, a green lamp must be carried upon the forward engine, The train or engine following, must be kept at least ten minutes behind, and run with great care.

6. Engineers, in approaching stations, switches or cross roads, must see that the way is clear, and the switch is right. The bell must be rung eighty rods before approaching a cross road or station, and rung until passed.

7. Red lamps must be exhibited at night on the rear car of all trains.

8. Brakemen on passenger trains, must be at their post, on the forward platform of the rear car, and apply the brakes on the proper signal of the engineer. One puff of the whistle, signifies that the brake must be tightened; two puffs, to be loosed again; and a continuous sound, approaching a station. Conductors will be particular to know that baggage and brakemen attend to their duty, and will be held responsible therefor.

9. The conductor of freight trains will see that the brakemen attend to their duty, and keep the doors of freight cars closed. The brakemen must be stationed on the rear of the train.

10. All working parties upon the track must give notice of any obstructions by their work, by exhibiting a flag at least eighty rods.

11. Engineers will not alow any person to ride upon the engine, without express authority.

12. All persons employed on passenger and freight trains, or at stations, must wear the badge prescribed by law.

13. Conductors will not pass any person free, without a ticket from a proper officer of the company.

14. Any person in the employ of the company, who refuses or neglects to observe the above instructions, will be promptly discharged.

The locomotives and tenders are examined daily by the master mechanic. Each engineer is also required to inspect the engine in his charge, and report any defect in the machinery to the master mechanic.

Passenger, mail and baggage cars, are carefully examined at each terminus of the road, by mechanics employed solely for that purpose, in addition to which, conductors, and brakeman of trains, are required to make the necessary examinations at the principal stopping places for wood and water. Persons are also employed for the purpose of making a similar examination of freight cars.

In order to insure a perfect system of examination and repairs, the road is divided into four divisions, each of which is in charge of a division superintendent of repairs, whose duty is to make a daily examination of tracks, branches, culverts, bridges, &c., and to keep every part in proper repair. They also perform other important duties under the direction of the general superintendent, connected with the management of the road.

Reply to the fifth interrogatory.

In addition to the precautions required by law, to prevent accidents at street and road crossings, the streets and crossings in cities and villages are watched, and flagmen are stationed at important road crossings, in order to ensure greater safety.

Reply to the sixth interrogatory.

The number and duties of each class of persons employed in the management of the road, not including those employed in construction, and the wages per day, month, or year, paid the same, is furnished in the following table:

TABLE.

No.	CLASS.	DUTIES.	WAGES.		
			Per Day.	Per Month.	Per Year.
4	Division superintendents,	Charge of repairs of track,			$900
21	Master mechanic,	Charge of locomotives and machinery generally,			1200
16	Section masters,	Do of parties rep'g track, bridges, culverts, &c.,		$35	
90	Laborers,	Employed in general repairs of track, &c.,	75		
30	Switch tenders,	Tending switches, & wooding & watering engines,		25 to 30	
8	Conductors,	Charge of passenger trains, &c.,		60	
8	Brakemen,	Employed on passenger trains,		5	
9	Conductors,	Charge of freight trains,		0	
9	Brakemen,	Employed on freight trains,		25	
24	Engineers,	On passenger and freight trains,	2 00		
24	Firemen,	do do	1 00		
14	Agents at passenger and freight stations,	Selling tickets & gen. pass. & freight attendance,		40 to 60	
16	Passenger depot attendance,	Employed in passenger business,		18 to 20	
15	Laborers at freight stations,	Loading, unloading, and handling freight,		18 to 20	
6	Baggagmen,	Employed on passenger trains,		40	

Reply to the seventh interrogatory.

The period of time between the starting of different trains, in the same direction, is from 5 to 15 minutes. Freight trains are required to remain at a station, in the night time, 15 minutes after the departure of a passenger train.

II. CHARACTERISTICS OF THE ROAD.

Reply to the first interrogatory.

The following table shows consecutively the length of each grade line, its elevation above tide, and grade in feet per mile.

Reply to the second interrogatory.

The length of each straight line, and the length and radius of of each curved line, are furnished in the following table.

Reply to the third interrogatory.

The weight of rail per lineal yard, of each portion of the road is 65 pounds.

Reply to the fourth interrogatory.

The dimensions of the cross ties used on the road, are 8 feet in length, 8 inches in width, and six inches thick. Their distance apart from centre to centre is two feet six inches.

Reply to the fifth interrogatory.

The number of street and road crossings at the level of grade, is forty five, the number above or over is six, and the number below is four.

Reply to the sixth interrogatory.

The number of switches and their location, and the number of switch tenders and their location and duties, on this road, are furnished in the following table.

TABLE.

STATIONS.	No. of Switches.	No. of Switch-men.	DUTIES.
Schenectady,	20	5	Switch-tenders and watchmen.
Junction of Saratoga railroad,	2	1	No other duty is assigned this man.
Hoffman's Ferry,	2	1	Switch and stationman, (switch is seldom used.)
Amsterdam,	10	2	General duties as switchman.
Tribe's Hill,	2	1	Switch and stationman, (switch is seldom used.)
Fonda,	10	2	General duties as switchmen.
Yost's,	3	1	Switch and stationman, (switch is seldom used.)
Palatine Bridge,	8	1	General duties as switchman.
Fort-Plain,	11	2	do do do
St. Johnsville and vicinity,	12	2	do do do
Little-Falls and vicinity,	17	3	do do do
Herkimer,	15	2	do do do
Frankfort,	5	1	do do do
Utica,	42	6	do do do
Total,	159	30	

Reply to the seventh interrogatory.

39 miles of the road has been fenced by the company, 26½ miles by the proprietors of adjoining lands, 8 miles is not fenced, and 4½ miles, adjoining the Mohawk river, no fence is required. That part of the road which is not fenced, the adjoining owners are obligated to build by the original contract of purchase, and for which they have been paid by the company.

Reply to the eighth interrogatory.

The space clear of all obstructions between the sides of bridges, rock cuttings, &c., is not less than two feet, except in one case, where the distance is only one foot.

Reply to the ninth interrogatory.

The following table shows the weight of the several locomotives and tenders, when supplied with fuel and water, and the portions or the road on which they are generally used, and the class of trains hauled by such engines.

TABLE.

No. of Engines.	Wgt. of Engine, with wood and water.	Wgt. of tender, with wood and water.	Wgt. of Engine and tender, with wood and water.	Size of Driving wheels.		Size of cylinder.	CLASS OF TRAINS.
	Pounds.	Pounds.	Pounds.	Ft.	In.	Inches.	
No. 1, ...	27,045	19,995	47,040	4	8	10½×16	Used for switching cars.
2, ...	36,070	24,055	60,125	4	8	12×16	Gravel trains.
3, ...	49,050	28,500	77,550	5	6	14×22	Express passenger train.
4, ...	54,900	34,880	89,780	5	6	15½×26	do do do
5, ...	35,515	26,460	61,975	4	8	12×16	Accommodation passenger train.
6, ...	36,070	24,055	89,780	4	8	12×16	Gravel train.
7, ...	44,550	26,470	71,020	5	0	12×26	Freight train.
8, ...	27,045	19,995	47,040	4	8	10½×16	Undergoing repairs.
9, ...	40,150	29,230	69,380	4	3	11½×21	Freight train.
10, ...	34,200	22,885	57,085	4	8	12×20	Undergoing repairs.
11, ...	34,200	22,885	55,085	4	8	12×20	Gravel and wood train.
12, ...	41,170	22,885	64,055	4	8	13×22	Freight train.
13, ...	37,150	29,230	66,380	5	0	13×20	Passenger train.
14, ...	44,340	31,480	75,820	5	0	12×26	Freight do
15, ...	43,100	26,470	69,570	5	0	13½×18	Passenger do
16, ...	41,170	22,885	64,055	4	8	13×22	Freight do
17, ...	41,170	22,885	64,055	4	8	13×22	Passenger do

18, ...	41,170	22,885	64,055	5	0	13×20	Freight train.
19, ...	41,170	22,885	64,055	4	8	12×22	do do
20, ...	51,480	28,540	80,020	5	0	14×14	Emigrant and freight train.
21, ...	51,480	28,540	80,020	5	0	14×24	do do
22, ...	51,240	28,640	79,880	5	0	14×24	Freight train.
23, ...	54,360	28,170	82,530	6	0	14×24	Passenger train.
24, ...	49,700	28,900	78,600	6	0	16×20	do do
25, ...							
26, ...	53,240	35,110	88,350	6	0	16×22	do do
27, ...	53,240	35,110	88,350	6	0	16×22	do do

The locomotives and tenders are run the entire length of the road.

Reply to the tenth interrogatory.

The maximum weight of passenger cars is eleven tons, of freight cars, eight tons, and of baggage cars, eight tons.

The weight usually allowed to be put into a freight car, is eight tons; although in some cases ten, and even twelve tons, have been carried in a car. The greatest number of cars run in a passenger train is fifteen, and in freight trains, the greatest number of loaded cars is forty-five.

Reply to the eleventh interrogatory.

The least diameter of the axles of passenger and freight cars, is 3¾ inches, and the least diameter of the journals of the same, is 3 inches.

Reply to the twelfth interrogatory.

We have safety beams under all passenger, freight, and baggage cars.

Reply to the thirteenth interrogatory.

The maximum running speed of express trains, is 38 miles per hour.

Reply to the fourteenth interrogatory.

To each ordinary train is allotted one breakman, but on large trains, when thought necessary, an additional number is furnished.

Reply to the fifteenth interrogatory.

Our engines and cars are run seventy-eight miles, from Schenectady to Utica, at which places thorough inspections are made by mechanics employed for that purpose.

C. VIBBARD,
Superintendent.

(A 5.)

Cayuga & Susquehanna R. R. Office,
Ithaca, *October* 1, 1852.

The Cayuga and Susquehanna Railroad Company, in reply to the interrogatories of Wm. J. McAlpine and Henry E. Bartlett, Esqrs., committee, &c., submit the following answers: The period referred to herein, being in all cases, the year ending the 30th day of September, 1852.

1. No accident has occurred during the year ending this date, involving the loss or injury of any of the company's property or that of individuals; nor has any passenger received any personal injury whatever; nor has any individual along the line of the road received any injuries either to his person or property, (except loss of cattle,) whether at road crossings or at other points.

No one in the employ of the company has received any injury causing loss of life or limb.

2. For answer to second interrogatory, reference is made to the first answer.

3. Nine cattle, six horses, four sheep, and five swine have been killed.

The company have paid for one pair of horses, $112.50; for two cattle, $28; for four sheep, $7; and for one hog, $5. Nothing further is to be paid, as the killing of the remainder was under such circumstances, that the company is not liable.

The law compelling railroad companies to pay for cattle killed, is considered penal in its character; should not owers of cattle found trespassing on R. R. tracks, be also subject to the penalties of the law?

If the money paid by railroad companies for cattle killed, could be appropriated to some charitable purposes, or be placed in the State treasury, the number of cattle killed, and the accidents thereby happening, would be greatly diminished. The owners of cattle killed, being generally well paid by the companies, there is a strong disposition on the part of some men to take this method of disposing of their old horses and stock. The number thus kept for sale along the line of this road, and for five miles back, during one period was unprecedented.

To prevent accidents, every precaution has been taken in the construction, equipment and operating the road, that a due regard for the safety of the travelling public and the property of individuals would require.

No expense has been spared in making the road-bed and timber structures of the firmest and most substantial character. The track is laid with a T rail weighing 58 lbs. to the yard, seven ties of from six to fourteen inches face, are laid under each point of rails eighteen feet. The line of the road is generally well fenced and cattle guards are provided at all highway crossings, and the signs as required by law.

All the equipment of the road has been obtained from makers of the highest reputation, and is of the best kind, as is shown from the fact, that since the opening of the road, some three years since, not an accident nor any damage to the company has ever been caused by a broken wheel or axle.

With a good road and equipment, as a further precaution against accidents, and for the successful operation of the road, the company has always employed the best men that could be obtained; requiring all the employees and particularly the head men in each department, to be men of sobriety and skillful in the performance of the duties of their respective situations. The head man of each department is held responsible for the diligence and faithfulness of those in his charge, employed with him.

All the engines and cars are subject daily to the inpection of those whose business it is.

The road is divided into sections of convenient length; each section being under the charge of a foreman, who is assisted by as many men as circumstances may require: there never being less than three section men on a section. All these section men are under the charge of a general track master, who is required to attend to it, that all the section men do their duty, in keeping the track in thorough repair, and in making their regular examinations, while going over their respective sections, before and after the passage of such trains, as the rules of the company may require.

All the bridges and timber works are under the charge and inspection of a man employed for no other purpose.

The running of trains, and the rights of the respective trains to the track, is provided for in the time tables, to which a strict observance is required.

One sound of the whistle is a signal for applying the brakes, and stopping the train; two sounds, to let go the brakes, and generally of starting the train; three sounds, to back the train; four, or more rapid sounds, is the signal for wooding. The whistle, or bell, is used as circumstances may require, in approaching all road crossings or stations.

A flag on an engine indicates a train following. A red flag by day, or a red light at night, is used to stop a train in cases of danger; but enginemen are required to regard any other demonstration that may be made of danger, in cases of emergency. Night trains are required to carry a lamp on the engine, and at the extreme end of the hind car of the train.

Trains are seldom run by telegraph, it being considered more safe to rely on general rules well understood by all employed. Mistakes and misunderstandings are liable to occur in the transmission and delivery of telegraphic dispatches; and moreover, it is generally impossible to communicate with all who are interested, and who ought to be advised of the departure and running of an irregular train, or of a regular train running out of its time. Great risk must attend a train running by telegraph, contrary to the rules of established time tables, when the passage of the train is unlooked for by the various track and bridge repairers along the line, and when the train goes along unexpected by those in charge of wood, gravel or some regular train, running perhaps behind its regular time.

5. No other precautions, than those required by law, are used at street and road crossings; nor have other precautions been deemed necessary.

6. The following is a statement of the number and duties of each class of persons employed in the management of the road, and their wages, not including those employed in construction:

No.	EMPLOYMENT.	PAY PER MONTH.
2	Freight agents, each per month,	$50 00
1	do do	7 00
1	Assistant do	26 00
1	General freight and ticket agent,	58 34
7	Laborers, each at	26 00
1	do	25 00
1	Watchman,	20 00
9	Brakemen, each at	25 00
3	Conductors, do	40 00
1	Baggage man,	15 00
1	General superintendent,	100 00
1	Superintendent of motive power,	75 00
3	Enginemen, each at	60 00
3	Firemen, do	32 56
2	Machinists, do	39 00
1	do	36 92
2	do each at	32 50
1	Blacksmith,	42 25
2	Carpenters, each at	45 50
1	Painter and carpenter,	45 50
2	Watchmen, each at	25 00
1	Superintendent of road repairs,	58 50
6	Foremen on sections, each at	32 00
16	Section men do	22 75

1	Superintendent of bridges and timber,......... ...	45 50
3	Carpenters, per do do each at......	32 00
2	Mail carriers, do	8 33
75		

2. The shortest period of time between the starting of different trains from any station is forty-seven minutes. This applies to regular trains only. Heavy freight trains are frequently divided into two trains—one directly following the other, at a safe distance,—other extra trains are frequently flagged by a regular train.

3. The weight of rail per lineal yard, for each portion of the road, is 58 pounds.

4. The cross ties on each portion of the road, will average eight inches face, by six inches in thickness, and eight feet long; distance from centre to centre, 257 feet.

5. There are two road crossings below the level of grade, and three above; twenty-three crossings at grade.

6. There are twenty-four switches on this road, distributed as follows:

At the Pier station, ...	1
" " Ithaca station,..........................	10
" " Gravel station, ...	1
" " Pugsley's station,.......................	1
" " Willseyville station,....................	2
" " Candor Center station, ...	1
" " " Corner station,..................	1
" " Cattatonk station,.......................	1
" " Stedman's station,.......................	1
" " Tinkham's station,.......................	1
" " Owego station, ...	4
	24

There are no switch tenders employed. Those in charge of the respective trains, are required to do their own switching, and the whole responsibility of the switches being, right or wrong, rests with them. The enginemen's instructions require, that as a train approaches a switch, the engineman must diminish the speed in such a manner, as to have perfect control of his engine, and such command as to stop it seasonably, if the switch is wrong; and at all times *on the supposition that the switch is wrong.*

There has never been a train off the track at a switch.

7. About five miles of the road is fenced by the adjoining land holders, under covenants running with the land, and about the same distance by the adjoining land holders, for a term of years. The remainder of the line has been fenced by the corporation, with the exception of about a mile-and-a-half, where the line runs through swamps.

8. There is a clear space of about three feet between the sides of the cars, and sides of bridges, rock cuttings, &c. No lumber, or wood, is allowed to be piled less than five feet from the track.

9. ENGINES, WEIGHT, &c.

	No. of pair Driving Wheels.	Diameter, do.	Size Cylinders.	Weight of Engine with Wood and Water.	Weight of Tender with Wood and Water.	Weight of Engine and Tender.	
Lackawana, ...	2	6 feet.	15×20 in.	23.50 tons.	21. tons.	44.50 tons.	Passenger.
G. W. Scranton, ...	2	5 "	16×20 "	26. "	21. "	47. "	Pass. and Freight.
Simeon De Witt, ...	2	5 "	16×20 "	26. "	21. "	47. "	do do
Tunkhannock............	3	5 "	18×20 "	33.50 "	25.10 "	58.60 "	Freight.
Cayuga, ...	3	4' "	17×20 "	28. "	24.10 "	52.10 "	do

With a light train and good rail, trains can be run through without taking wood or water ; with a heavy train and bad rail, wood and water is taken as circumstances require.

10. The maximum weight of passenger and baggage cars is eight tons; of freight cars, six and a half tons; maximum load of freight cars is twelve tons; greatest number of cars in a train, one hundred and thirteen; weight of heaviest train, seven hundred and eight tons, hauled from Oswego to Ithaca, by Engine "Tunkhannock," built by Rogers, Ketcham & Grosvenor.

11. The least diameter of axles of passenger and freight cars and journals of the same, is 3⅞ inches. Passenger and baggage, all have safety beams.

12. No express trains, as such, run regular time of passenger trains, thirty miles per hour, maximum forty. Six trains, daily, pass over the road, passenger and freight.

13. One brakeman is deemed sufficient for four passenger, or eight to fifteen freight cars.

14. The engines and cars are subject to rough inspection at the end of each trip, 35 miles, and also at the different way stations. It is the duty of the engineers and conductors, to watch, closely, the engine and cars of their respective trains. The whole being under the immediate charge and inspection of the superintendent of motive power. Respectfully submitted,

W. R. HUMPHREY,
Sup't. Cayuga & Susquehanna Railroad.

(A 6.)

OFFICE OF THE OSWEGO AND SYRACUSE RAILROAD CO.,
SYRACUSE *October* 15*th*, 1852.

Gentlemen—I have received your circular of interrogatories, addressed to the railroad companies, of this State, requesting answers to various statistical and other information connected with accidents upon railroads.

I take pleasure in giving you the desired information, from this road, and I am fully convinced that if this subject receives proper attention, and investigation, by the Legislature, and the public, followed by the suitable enactments, will, doubtless, render railroad accidents of less frequent occurrence.

This road has been remarkably free from accidents, none of note having occurred for the two years preceding the date of the last annual report to the Legislature. The first injury to persons since that date was on the 17th day of October, 1851. A small boy, of about seven years of age, was run over by a gravel train, and so badly injured as to cause his death within a short time. It occurred as follows: A gravel train was backing into a branch in the city of Oswego, the engine not having sufficient steam to move the train, the laborers employed with the cars, were assisting; and while in this slow motion, several boys, and this one among the number, were getting into the cars for a ride. They were warned by the foreman and other persons, to desist, and when driven from one side of the train, in attempting to pass around to the other side, the boy, probably, fell on the track and was run over by the dirt car. No person connected with the train or road could, in justice, be blamed for the occurrence; and it can only be considered recklessness or carelessness of the boys themselves. For the medical attendance, &c., (as the boy's parents were poor,) the company paid $65.

2. On the 12th day of May last, the bridge over the Nine Mile creek gave way when the train was passing over it. The engine, tender and one car, passed over safely, but the baggage car had its trunks torn from under it, and one trunk was displaced from the first passenger car. In the collision, a passenger was thrown partly from his seat, and his head was somewhat injured by coming in contact with the side of the coach, and besides the injury to the cars and the bridge, there was a slight injury to another person, with the loss of some apparel. The whole damage to persons for medical attention, board, suit of clothing &c., cost the company forty-four dollars.

The timber of this bridge, upon close examination afterwards, was found defective, and was probably so in the interior, to some extent, when the bridge was erected, about four years since.

3. On the night of the 7th of September last, a freight car took fire upon the road, and before the fire could be extinguished, destroyed a large portion of the freight, and the upper part of the car. From what cause the fire originated is unknown, but as a part of the freight was furniture and medicine, it was probably produced by spontaneous combustion of some of its contents. The loss by this accident to the freight, was about $950.

The killing of cattle and other domestic animals upon the line of the road, is of frequent occurrence. Cattle are permitted to run at large in the streets and roads, and in many instances it is difficult to ascertain by what means the fences were thrown down, and cattle and other animals find their way upon the track of the railroad. The carelessness of land owners, and those employed by them, in leaving fences down and gates open, will in part account for accidents, and in some instances, better pasturage, may induce the animals or their owners to take advantage of the company's land, and by so doing, endanger the property of the company, and the lives of the cattle thus trespassing.

There has been within the last year killed by the trains, 2 horses, 10 head of cattle, 6 sheep, and 5 hogs, at a cost to the company, in the aggregate, of two hundred and forty six dollars;

and besides these there are 4 cows reported killed, but not yet settled for.

4. As our trains run almost wholly in the day time, there is less necessity of precaution than if run by night. The track can usually be seen by those that manage the trains, and with proper precaution and attention, accidents may, to a great extent, be avoided.

There are signal flags for all the trains in the vicinity of Syracuse, and it is made the duty of the station men to have the track clear on the arrival and departure of the cars.

5. The rolling stock of this road is regularly examined by a competent mechanic at each end of the road. The track and bridges, by the superintendent and overseer, and also by the foreman of the repairing parties.

6. We have five repairing parties, having regular portions of the road allotted to each, of about 7 miles. And the parties have usually a company of from 4 to 6 men in each, besides the foreman. The superintendent has a salary of $1,200 per annum, the general overseer, $45, per month, the foreman of the parties, $30 per month, and the common laborers, 87½ cents per day. Connected with the shop, there is a superintendent of machinery, at $60 per month, and 8 machinists, at from ten to fourteen shillings per day, each.

We have an engineer upon each of our 5 locomotives, at about $2.00 per day each, and an equal number of firemen at 7s. 6d. per day. We have also station men, at from $25 to 30 per month, and watermen at the usual price of other common labor.

The passenger trains have each a conductor, at $40 per month, and the baggage or brakemen.

CHARACTERISTICS OF THE ROAD.

1. The cross ties average 6 by 8 inches, and are placed 3 feet apart from centre to centre.

2. There are 37 road and street crossings, one above the grade, all the others at the grade of the road.

3. We have 14 switches, 2 at Baldwinsville, 4 at Oswego, and one each, at Syracuse, Stiles', Lamson's, Seneca river, Granby, Fulton, Salmon's, and Millers' in the town of Granby. The station men and their assistants attend to switches, except at Syracuse and Oswego.

4. At Syracuse, Geddes and Oswego, the road is partially fenced; about one mile in the town of Granby, in the woods, it is not fenced, the remainder of the road is fenced at the expense of the company.

5. There is generally two feet or more clear of obstructions, at the several bridges outside of the cars.

Weight of Locomotives and Cars.

No. 1.	Oswego, 25 tons,	including	wood	and water;	passg'r. train.
2.	Ontario, 25 do	do	do		do
3.	Frontier, 26 do	do	do		do
4.	Vixen, 18 do	do	do	wood and freight.	
5.	Toronto, 18 do	do	do	earth and gravel.	

Weight of passenger cars, 16,000 pounds.
do baggage do 14,500 do
do freight do 15,000 do

Greatest load in freight cars, 8 tons usually 7½ tons.
do number of cars in train, 16.

Diameter of axles, 3½ to 4 inches, of Journals, 2½ to 3 inches.

We have safety beams in all the passenger, baggage and freight cars.

The maximum running speed of express trains, 25 miles per hour.

There is one brakeman on each of the trains.

The engines are inspected at each end of the road, at Syracuse by an inspector, and at Oswego by a good mechanic.

The laws of this state in regard to railroad accidents are defective, they should more clearly define the rights of passengers, the rail road company, and the public.

A railroad company should not be liable for an accident, where persons ride without permission on the engine, the tender, the baggage or freight cars, nor should they be so liable for an accident when persons, against rules, ride upon the platform, or are getting on or off the cars when in motion, but above all the companies should have the exclusive occupancy of the railroad track.

A railroad is the *modern highway* for the rapid transit of persons and property and the United States mail, and their introduction has added greatly to the facility the commercial interchanges of the country. The velocity ot movement of the trains especially with heavy loads, renders their control difficult, for it is well known that when in full speed, that it requires both time and space to stop them; they cannot turn out to avoid danger or collision; they however occupy but a narrow space, and this necessary track should be open and free at all times for their use, and by proper legal enactments should be kept clear of encroachments by men or animals. A law of this kind backed by a healthy public opinion, would be a great safeguard to the lives and property of farmers, and others living in the vicinity of the road, as well as to the great railway traveling public. The necessity of a law upon this subject is indicated by the practice of other States and countries; how unlike ours is that of England, where even walking upon the line of the railroad is prohibited by a penal enactment.

The exclusive use of the track of a railroad is one of the most important privileges granted by the Legislature to the company in the passage of their charter. And the railroad companies are doubtless entitled to this privilege, in consideration of the extra price paid to the former owners for the land over which their track is laid.

Respectfully submitted,
HOLMES HUTCHINSON, *Pres't.*

HON WILLIAM J. MCALPINE, and
CHARLES E. BARTLETT,
Committee, &c.

(A 7.)

Office of the Rochester & Syracuse R. R. Co.
Rochester, Oct. 14, 1852.

To Wm. J. McAlpine and
Henry E. Bartlett, *Committee :*

Herewith I send you my answer, to interrogatories received at this office. Sometime since, your circular was sent to Mr. Gibson, our President, and by him forwarded on to me to answer. I have showed the report to him. I think he is quite well satisfied.

I also enclose one of my time tables, with rules, &c.

Yours, with great respect,
(*Signed*) CARLOS DUTTON, *Sup't.*

(Copy.)

Office of the Rochester & Syracuse R. R. Co.
Rochester, Oct. 11, 1852.

Wm. J. McAlpine and
Henry E. Bartlett, *Committee :*

Gentlemen,—The resolution of the Senate and of the select committe, relative to ailroad accidents and their cause, have been forwarded to this office. In answer, we submit the following

1. accidents :

1. The first accident that occurred on this road, after our " annual report of 1851," occurred at Cayuga, October 23, 1851. One of our men was upon the top of one of the passenger cars arranging the bell cord, and came in contact with a bridge. He was somewhat injured, but recovered in a week or two.

On the 1st of November, two men riding in a two-horse wagon, near Waterloo, in attempting to cross the railroad, were upset by coming in contact with the engine. The horses ran away, but nothing serious. This was great carelessness on the part of the driver, thinking he could cross the track before the train would overtake him. The usual signal was given by bell and whistle. A disinterested person saw the whole affair, and gave it as his opinion that the company, in this case, were not in the least in fault.

On the 5th November, killed a horse at a public crossing, and horse running at large. The engine and cars escaped without injury.

On the 6th November, ran against a cow on a cross-road. Cow running at large.

On the 7th November, broke a shaft under one of the tenders. A safety beam prevented any injury to any part of the train.

On the 27th December, one of our men in attempting to couple up a train in the night, at one of our stations, got caught between the tender and car, and so much injured, as to cause his death in a few days. The man was somewhat inexperienced.

On the 1st May, a few miles west of Canandaigua, express train, bound west, came in contact with a horse and buggy. There was a gentleman and lady in the buggy at the time. The lady was killed instantly. The report of the conductor stated, that the horse stopped still after getting on the track. The usual signal was given before reaching the cross-road. It was raining at the time, and the buggy a covered one. The driver of the horse said he did not see or hear anything of the train until it was upon him.

On the 4th May, a Mrs. Mershon, in attempting to cross the railroad track in the village of Waterloo, came in contact with the engine of the express train, bound west, and was instantly killed. The conductors report stated that the whistle was sounded before reaching the village, and while passing through. It was supposed, by those standing by, that the lady thought she could step across the track before the train would pass.

On the 18th May, the express train going east, ran against a man near Syracuse, killing him instantly. The man was walking in the same direction of the train. The engineer gave timely warning, and did all he could to stop the train. The conductor,

H. M. Frink, thinks every possible effort was made to avoid the accident.

On the 22d May, night express train came in contact with a woman, who was walking on the track about a mile from the depot east of Rochester. She was walking towards the engine. The engineer saw her and sounded the whistle; she did not seem to take any notice of the approaching train. Every effort was made to stop the train, but not in time to save her life.

On the 5th July, mail train bound east, when about 5 miles east of Canandaigua, ran over a cow where the track crosses the public highway. The cow was thrown by the pilot outside of the track, the engine, baggage and mail cars passed by the cow, she rolled back upon the track and threw 3 passenger cars off the track and down an embankment. Two of the cars turned over on one side. Several of the passengers were considerably injured, one of our men, a brakeman, lost his life. Damage to the cars of 300 dollars.

On the evening of the 13th July, night express train bound east, when about 15 miles from Rochester, ran over a man who was trying to walk on the track, drunk; the man was instantly killed.

On the 8th August, first express train east ran off the track at Waterloo. We think the switch must have been been displaced by some evil disposed person. The switch lever was in its proper place, but the rod that holds the switch bars from spreading apart was made insecure by the key being taken out, which could not have been done without help. Several passengers were somewhat injured, and bones broken. Damage to engine and passenger cars about $340.

On the first September, car ran through freight train bound east, took fire from some straw being placed in the car for a horse to stand upon. Before the train could be stopped the horse died from suffocation. The owner of the horse was in the car at the time and was somewhat burned.

One of our freight conductors fell from the train while in motion, and was instantly killed.

No accidents have occurred by reason of trains running out of time or from collisions. No injury to persons or property or passenger trains from the breaking of wheels or shafts. We have now safety beams under all our passenger cars which prevents injury in case of shaft breaks.

We have killed a large number of cattle and other animals; a a large portion of them were in the public highway, running at large.

We have paid for cattle as a compromise,	$915 00
" " " " horses " "	525 00
" " " " hogs, " "	111 00
" " " " sheep " "	22 00
Total,	$1,573 50

In view of the great danger experienced from cattle running at large in the public highway, this company have placed watchmen at all the principal road crossings, to prevent cattle crossing the track when trains are due, and also to prevent careless persons from driving upon the track when trains are approaching.

Enclosed I send you a copy of our rules and regulations for the running of the road, to be used by conductors and engineers.

We have men at each end of the road to examine daily all our working stock.

We also have men whose duty it is to examine daily the track, bridges and culverts.

Number of men employed in the management of the road:

No. of conductors,	16
" breakmen,	40
" clerks,	13
" freight agents,	12
" receivers,	5
" station, switch, wood and water men,	95
" engineers,	27
" firemen,	40
" machinists,	40
" forgers and helpers,	24
" boiler makers,	7
" carpenters building and repairing cars,	24

No. of painters,	7
" track repairers,	45

In addition to the above number, we have had a large number of men, from 3 to 400, relaying our superstructure, for the last 5 months.

For the length of road grade line, its elevation above tide water, and grade in feet per mile, the length of its straight, and radius of each curved line, I would refer you to our map, left at the office of the State engineer about 1 year 9 months since.

Weight of rail per lineal yard about 65 lbs.

Our cross ties are 8 feet in length, six inches in thickness, and from 7 to 16 inches in width, and are placed two feet six inches apart, from centre to centre.

We have 96 street and road crossings, 5 above and 3 below grade, about 60 switches and 30 switchmen.

Our road is all fenced by the company, with but very few exceptions.

Space clear of all obstructions between sides of cars and sides of bridges, is at least two feet.

The weight of engines rank from 16 to 24 tons, medium size of passenger engines is 22 tons.

The maximum weight of passenger and freight cars, is about 8 tons. We carry 10 tons weight in cattle cars, and eight tons in ordinary freight cars; our freight trains number from 15 to 30 cars.

All our new axles under passenger and freight cars, that have been used for the last 2 years, are 4 inches in diameter, with 3 inches journals.

The maximum running speed of our express trains, is 30 miles per hour. We have one train that runs at much higher speed.

We have safety beams under all our passenger cars and under the most of our freight cars.

We have 2 breakmen on each of our express trains, and from 3 to 4 on emigrant and freight trains.

Our engines and cars run the length of our road, which is 104 miles. They are thoroughly examined at each end of the road and are partially examined at 3 intermediate points on the road.

The above is respectfully submitted,

(Signed) CARLOS DUTTON,

Superintendent.

(A 8.)

OFFICE BUFFALO, CORNING & NEW YORK R. R. C.,
BATH, *October 14th*, 1852.

WM. J. MCALPINE, Esq.:

Dear Sir—I enclose herewith the answers of this Company to interrogatories proposed by the Select Committee, appointed under a resolution of the Senate, passed April 15th, 1852.

Very respectfully,
Your ob't serv't,
(Signed,) E. HOWELL, JR., Sec'y.

(COPY.)

The answer of the Buffalo, Corning and New York Rail Road Company, to interrogatories proposed by the Select Committee, appointed under a resolution of the Senate, passed April 15th, 1852.

I. ACCIDENTS.

1. In answer to the first interrogatory, they state that they commenced operating their Road on the 15th day of April last; that the first accident occurred on the 1st day of May last, near Curtis' station, by running against a cow, throwing her from the track and breaking one of her legs. The cost to the Company was $36.75, being the amount paid to the owner of the cow.

2. In answer to the second interrogatory, they state that the second accident occurred on the 8th day of June last, about two miles west of Bath, and was occasioned by a stick of wood falling upon the track, which threw off the track four (light) platform cars, by which they were damaged to the amount of $125, the cost to the Company of having the same repaired.

The third accident occurred July 23d, last, about three miles west of Savona, occasioned by running against a steer, by which the steer was thrown off the track and killed. The cost to the Company was $22, being the amount paid to the owner of the steer.

Up to this time the company were running but one train, carrying both passengers and freight.

The fourth accident occurred on the 18th day of September last, about three miles east of Wayland, occasioned by running against a cow, throwing her from the track and killing her. The cost to the Company will be about $20, to be paid to the owner of the cow.

The fifth accident occurred on the 20th day of September last, about one mile west of Blood's, by running against a cow, throwing her from the track and killing her. The cost to the Company will be about $20, to be paid to the owner of the cow. The two accidents last mentioned occurred to the express passenger train.

In all of the cases, the trains were in due time, according to the time tables, and the accidents were occasioned by defects in the fences, the Company not having at the time of such accidents, fully completed their fencing.

3. In answer to the third interrogatory, they state that four cattle have been killed or injured since they commenced operating their road; the amount of damages paid or to be paid in each case, being stated in the answers to the foregoing interrogatories.

4. In answer to the fourth interrogatory, they state that they have annexed hereto a copy of their instructions for running trains, &c., which will show their system of signals by flags and lights, as well as the other precautions taken, to prevent the occurrence of accidents.

That their total exemption from accident to this time, (except the trifling ones before mentioned,) in their opinion, is mainly attributable to the fact that none but prudent and careful persons, *of strictly temperate habits*, have been employed upon the trains, or in any way connected with operating the Road.

Locomotives are examined daily by the master of the motive power, after having made a round trip over the Road. The cars, both freight and passenger, are examined daily by a competent mechanic, detailed for that particular business.

The track is divided into sections of four miles each; a competent foreman and three laborers are assigned to each section, making a man to each mile of road, whose business it is to inspect daily, and keep in repair the work upon their respective sections.

To each twenty miles of the road, is assigned a competent man, who has the direct supervision of the section men, and who has the especial care of the bridges, culverts, &c., and whose duty it is, personally to inspect the entire superstructure on his division, as often as may be.

5. In answer to the fifth interrogatory, they state, that no other precautions, than those required by law, has been adopted at street and road crossings.

6. In answer to the sixth interrogatory, they state, that they have in their employment, eleven station agents, nine of whom perform all the duties required at their respective stations, including attending to, and properly adjusting the switches, &c., &c. At Bath, the agent employs a man in attending to the switches, loading, and unloading freight, &c.; and at Corning, the agent employs a clerk and switchman. The salaries paid the station agents, varies from $20 to $40 per month. They have also in their employ,

One master of motive power—Salary,	$800	per year.
Two engineers	60	pr. month.
One engineer, (on gravel train),	40	"
Two firemen,	30	"
One do., (on gravel train),	20	"
Two conductors,	40	"
One baggage man,	25	"
One do., and Express messenger,	30	"
Five brakemen,	25	"
Four watchmen; one at each terminus of the road,	25	"
One car inspector,	40	"

7. In answer to the seventh interrogatory, they state, that they are now running daily but two trains, each way, over their road

one leaving each terminus about the same time, so that the interval between the starting of different trains, from the same station, moving in the same direction, is about six hours.

2. Characteristics of the Road.

1. For answer to the first interrogatory, they refer to the schedule, hereto annexed, marked A.

2. For answer to the second interrogatory, they refer to the schedule, hereto annexed, marked B.

3. In answer to the third interrogatory, they state, that on nine miles of their road, (from Painted Post, west,) the weight of the rail used, is sixty and one-half pounds per lineal yard, and for the remainder of the distance the track is laid, (about thirty-seven miles,) the weight of the rail is about fifty-seven pounds per lineal yard.

4. In answer to the fourth interrogatory, they state, that the cross-ties used, are six inches thick, by eight inches wide, and nine feet long, and they are laid two feet and four inches apart, from center to center.

5. In answer to the fifth interrogatory, they state, that there are forty-three street and road crossings, at the level of grade, on that portion of their road in operation, (forty-five miles,) and that there are none above or below grade.

6. In answer to the sixth interrogatory, they state, that they have 31 switches, as follows:

3 at Painted Post,
2 " Coopers,
1 " Curtis,
3 " Campbell,
3 " Savanah,
5 " Bath,
2 " Kennedyville,
2 " Ovaca,
1 " Wallace's,
3 " Liberty,
2 " Blood's,
4 " Wayland.

For answer to the remaining part of the interrogatory, they refer to their answer to the sixth interrogatory, under the head of "accidents."

7. In answer to the seventh interrogatory they state, that all of their road has been fenced by the company, excepting only about five miles, which is not yet fenced.

8. In answer to the eighth interrogatory, they state that the space between the sides of the car and the sides of the bridges, rock cuttings, &c., clear of the obstructions, is three feet and six inches.

The company have no means of ascertaining the weight of the several locomotives and tenders, when supplied with fuel and water, nor the maximum weight of their passenger, freight and baggage cars.

The greatest weight carried in any freight cars is ten tons; and the greatest number of cars allowed in a train is twenty.

They have in use three locomotives, each weighing about twenty-five tons, one on the express passenger train, one on the mail and freight train, and the other on the gravel train.

The diameter of the axles of passenger and freight cars, varies from 3½ inches in the centre, to 4 inches at the shoulder, and at the journals, 3¾ inches.

We have no safety beams on any of our cars. The guage of the road is six feet, and the bearings of the axles are inside of the wheels, which obviates the necessity for using safety beams.

The maximum running speed of the express passenger train, is 24 miles per hour, and of the other trains, 15 miles per hour.

The engine and cars are run from Corning to Wayland, (45 miles,) and back, after which they are thoroughly inspected by the master of motive power, and the car inspector, as stated in the answer to the 4th interrogatory, under the head of "incidents."

All of which is respectfully submitted,

(Signed) J. A. REDFIELD,
Superintendent.

To Hon. H. C. Bartlett, and W. J. McAlpine *Committee.*

(COPY.)

(A 9.)

OFFICE OF CANANDAIGUA AND ELMIRA RAIL ROAD CO.,
CANANDAIGUA, *October* 12*th*, 1852.

WM. J. McALPINE, *State Engineer :*

Sir—In accordance with the resolution of the select committee on railroads, appointed by Senate resolution of April 15, 1852, I herewith transmit to you the answers to the interrogatories sent this company as nearly as it can well be done under our relations with the New-York & Erie Railroad Company.

Hoping the information contained in them will answer the purposes designed,

I remain, truly, your obedient servant,
(Signed) WILLIAM G. LAPHAM,
Superintendent C. & E. R. R.

(COPY.)

Answer to interrogatories of special committee of Senate resolutions of April 15, 1852, to investigate the causes of railroad accidents in the State of New-York.

ACCIDENTS.

Answer to Interrogatories.

1. On the 5th of November, 1851, John Agin was killed, in the following manner, viz: while riding on the gravel train, the car on which he was riding, dumped its load while the train was in motion. Agin fell off the car, and in attempting to get on to the car, he fell between two cars and was instantly killed.

At Canandaigua station, on the 5th day of May 1852, John Thornton, a cartman, was on his cart, which was run against by locomotive to passenger train, throwing Thornton on to the ground, and in getting up, he threw his feet under the driving wheels, and had one foot so severely hurt, as to render amputation of his leg necessary; he was warned to get his cart out of the way, but failed to do so, and by his own carelessness received the injuries above stated.

2. On or about the 28th day of January last, the passenger train ran off the track two miles south of Canandaiga, and did considerable injury to the track; no perceptible damage was done to cars or engine.

On the 12th day of May, near Penn Yan station, the axle in forward track of tender broke, which broke the other track of tender, and both tracks to baggage car in pieces, completely demolishing them, and causing some injury to tracks to passenger car. No other injury.

3. Thirty-two.

Eighty-three dollars have been paid, therefor, and one hundred and forty-five dollars are claimed in addition, which the company refuse to pay, because cattle were on highway.

4. This road is run by the New-York and Erie railroad company, and all the precautions of their system have been observed, to prevent accidents.

5. None others.

6. Eight agents (freight and ticket,) $30 to $40 per month; four baggage agents, $26 per month; six switchmen and helpers, $22 per month; eleven section-men $30 per month, partly.

7. At same time.

CHARACTERISTIC OF ROAD.

1. See table.

2. Do. do.

3. Fifty-seven pounds.

4. Average 6 by 8. Seven ties in 18 feet, or 2. 57 feet from center to center.

5. 50. Road and streets at grade, 3 do under, one over.

6. Nineteen.—one switch tender at Canandaigua, one at Gorham, one at Penn Yan, one at Hemrod's, one at Starkey, one at Rock stream.

Our switchmen, except at Canandaigua, are required to attend to such duties, as the station agent may require, when not actually at the switch.

7. Road all fenced by the company.

8. No slope or other structure, within ten feet of the rail, except paltforms, for freight or passengers.

One locomotive, weight 25 tons, used only for graveling the road. The answers given by the New-York, and Erie co., will conclude the inquiries, as the trains belong to them, and are run under their directions.

OFFICE OF CANANDAIGUA AND ELMIRA R. R. COMPANY,
CA ANDAIGUA, *Oct.*, 12 1852.

I certify that the foregoing statements are correct, that the tables accompanying the same are nearly correct, being approximate tables. A map and profile in conformity with the Law is nearly completed, and will be forwarded to the State Engineer's office, with the next annual report, and any error in the tables, herewith enclosed will be corrected thereon.

(*Signed*) WILLIAM G. LAPHAM,
Sup't. C. & E. Railroad.

(A. 10.)

The Hudson and Berkshire Railroad Company, in answer to the interrogatories by the State Engineer, and pursuant to the Senate resolution, passed April 15th, 1852, says:

Answers to interrogatories.

1. The first accident was the partial burning of a small bridge, on the line of road, in the month of July, last, in the town of Chatham. It occured, probably, from a spark from the engine, and was not discovered till the track repairers came up after the train. The damage was very slight.

2. The second accident was the killing a young man, named Southard, at the Ghent station, September 24, 1852. The train (a freight train), was backing down, and passing the platform, on which Southard stood, and he attempted to jump upon the side of the tender. It is supposed that he failed in catching with his hands as he intended, as he fell between the tender and platform, and the engine passed over him.

No other accidents have occurred during the year.

3. Our several trains have killed some six cows, and several sheep, during the year. We have never paid anything for such killing. The first case that occurred on the road, we contested, and defeated the complainant. We have not been troubled with any suits since.

4. Our trains are so few, and road so short, (34 miles), that we are not liable to collisions. No train is allowed to leave a station where another train is to pass, until the other train arrives, or is heard from. We have no signals, other than the ordinary ones of bell and whistle, and do not run in the night. The superintendent of machinery, examines daily the engines, and the superintendent of cars does the same with the cars, and repairers of track inspect their respective divisions.

5. We have adopted none other.

6. One general superintendant of road, salary,........$1,000

do supt. of machinery,	$800	2 ast's. at $40 per month.
do do cars,	$400	1 do $35 do do
do general clerk,	$800	1 ticket clerk, $480 per an.
2 engine men, each	$600	2 conductors, each $600,
2 brakemen, do	$360	2 firemen, do $312,
5 foremen of track,	$420	5 assistants, $1 per day,
1 freight master,	$480	1 station agent, $500 per a.
1 station agent,	$420	2 do do each $360,
1 do do	$240	1 do do $100,

Say 12 additional laborers at 87½ cents per day.

7. From 3, to 4 hours.

CHARACTERISTICS OF ROAD.

Answer to Interrogatories.

1. We can give no other table than the annexed, as we have no engineer and can gather from our profile only what we give.

2. Same answer as next above.

3. 56 pounds per yard.

4. 7 feet long 7 inches thick, 3 feet from centre to centre.

5. At the level 33, above 5, below, 1.

6. We have 22 switches as follows:

At Hudson 7, Miltonville 2, Way Pass. 1, Ghent 1, Chatham 3.
do Tompkins Mill 1, E. Chatham 2, Summit 1, Edwards 2.
do State Line 2. At Hudson a special tender, at other stations the station agent attends to this duty.

7. Nearly all our road is fenced, and all by proprietors of adjoining land, except about half a mile in Hudson.

8. Not less than 2 feet, generally 3 feet, or over.

Our engines are employed promiscuously in all trains, and weigh, all equipped with tenders, &c., as follows: "Adams," 40 tons, "Milton," 36$\frac{ }{8}$ tons, "Pittsfield" 24 tons, "Hudson" 20 tons.

Passenger cars weigh 8 tons, freight cars 7 tons, 10 tons greatest car load, 10 cars, (8 wheels) in train, sometimes 12 cars.

Diameter of axles, 4 inches, journals 3 inches.

We have few, if any safety beams.

Maximum running speed 30 miles per hour.

We have usually on each train two persons to apply brakes when needed.

Our engines and cars run 34 miles and then are examined, but are usually run out and in, 68 miles, as the superintendent resides in Hudson.

Respectfully submitted,
J. W. FAIRFIELD, *President.*

Hudson, Nov. 9, 1852.

(A 11.)

OFFICE WATERTOWN & ROME R. R. CO.,
ROME, *Jan.* 8, 1853.

Hon. Messrs. MCALPINE & BARTLETT:

Gents,—I trust you will accept the views you have kindly allowed me personally to express, upon the subject of railway accidents, as my Report. The grade and curve table, is herewith respectfully submitted.

Respectfully yours, &c.,
R. B. DOXTATER.

I. CHARATERISTICS OF THE ROAD.

1. 19.561 miles, level.

9.740	"	0	to	8	feet	inclination	per	mile.
7.710	"	8	"	12	"	"		"
8.910	"	12	"	16	"	"		"
13.755	"	16	"	25	"	"		"
16.394	"	25	"	32	"	"		"
19.663	"	32	"	40	"	"		"

2. 75.574 miles straight line.

0.246	miles curve, radius	1000	to	1500	feet.
1.412	"	1500	"	2000	"
1.693	"	2000	"	2500	"
2.28	"	2500	"	3000	"
3.50	"	3000	"	4000	"
2.612	"	4000	"	5000	"
7.916	"	5000	"	7000	"
0.50	"	7000	"	10000	"

3. The weight of iron rail upon all tracks is 56 lbs. per lineal yard.

4. About $\frac{3}{4}$ of the cross-ties are 8′ × 7″ + 3″ to 9″ bearing face
and 8 ties to rail of 21 ft. length,
averaging $2\frac{67}{100}$ ft. between centers,
but are placed nearer at joints, &c.
" $\frac{1}{4}$ " are 8′ × 6″ & 7″ + 6″ to 8″ face, and
10 ties to each rail, equal $2\frac{3}{10}$ ft.
between centers.

5. There are 87 street & road crossings at grade.

" 4 " " below " 1 of which is canal
" 7 " " above " [towing path.

6.	Rome,	10	switches on	branches.
	do	6	do	main track.
	McConnellsville,	2	do	do
	Phelps' Mill,	1	do	do
	Camden,	2	do	do
	West Camden,	1	do	do
	Williamstown,	2	do	do
	Kasong,	1	do	branch.
	do	2	do	main.
	Sand Banks,	2	do	do
	Centreville,	1	do	do
	Richland,	1	do	branch.
	do	2	do	main.
	Sandy Creek,	2	do	do
	Mannsville,	2	do	do
	Pierpont Manor,	1	do	branch.
	do	3	do	main.
	Adams,	2	do	do
	Adams Center,	2	do	do
	Watertown,	7	do	branches.
	do	5	do	main.
	Brownville,	2	do	do
	Limerick,	2	do	do
	Chaumont,	1	do	branch.
	do	2	do	main.
	Three M. Bay,	2	do	do
	Cape Vincent,	15	do	do

8. The canal bridge at Rome has a clear space, between trusses of 13′.4″, leaving 2′.8″ between side of cars and truss. This is the only covered bridge upon the R. R. The other bridges are generally low trusses, rising from 1½ to 2½ ft. above top of rail, and have a clear space of 11″.8″ between trusses.

There are no tunnels upon the Road. The rock cuts, with two exceptions, are about 30 ft. wide at grade, with side slopes of ¼ to 1. One cut near Watertown, about 250 ft. long, is 18 feet wide at base, and slopes as above; and one at Chaumont. 18 ft. wide at base, and is now being widened to 30 feet.

(No. 1.)

Extract from the report of the commissioners in Great Britain, on the subject of the application of irons to railway structures.

The questions to be examined may be arranged under two heads, namely:

I. Whether the substance of metal which has been exposed for a long period to percussions and vibrations, undergoes any change in the arrangement of its particles, by which it becomes weakened?

2. What are the mechanical effects of percussions and of the passage of heavy bodies in deflecting and fracturing the bars and beams upon which they are made to act?

A great difference of opinion exists among practical men with respect to the first of these questions. Many curious facts have been elicited by us in evidence, which show that pieces of wrought iron which have been exposed to vibration, such as the axles of railway carriages, the chains of cranes &c., employed in raising heavy weights, frequently break after long use, and exhibit a peculiar crystalline fracture and loss of tenacity, which is considered by some engineers to be the result of a gradual change produced in the internal structure of the metals by the vibrations. In confirmation of this, various facts are adduced, as, for instance, that if a piece of good fibrous iron have the thread of a screw cut upon one end of it by the usual process of tapping, which is always accompanied by much vibratory action, and if the bar be then broken across, it will be found that the tapped part is a good deal more crystalline than the other portion of the bar. Others contend that this peculiar structure is the result of an original fault in the process of manufacture, and deny this effect of vibration altogether, whilst some allege that the crystalline structure can be imparted to fibrous iron in various ways, as by repeatedly heating a bar red hot, and plunging it into cold water, or by continually hammering it, when cold, for half an hour or more.

Mr. Brunel, however, thinks the various appearances of fracture depend much upon the mode in which the iron is broken. The same piece of iron may be made to exhibit a fibrous fracture when broken by a slow, heavy blow, and a crystalline fracture when broken by a sharp short blow. Temperature alone has also a decided effect upon the fracture; iron broken in a cold state shows a more crystalline fracture than the same iron warmed a little.

The same effects are by some supposed to be extended to cast iron.

We have endeavored to examine this question experimentally in various ways.

A bar of cast iron 3 inches square, was placed on supports about 14 feet asunder. A heavy ball was suspended by a wire 18 feet long, from the roof, so as to touch the centre of the side of the bar. By drawing this bar out of the vertical position at right angles to the length of the bar, in the manner of a pendulum, to to any required distance, and suddenly releasing it, it could be made to strike a horizontal blow upon the bar, the magnitude of which could be adjusted at pleasure, either by varying the size of the ball or the distance from which it was released. Various bars, (some of smaller size than the above) were subjected by means of this apparatus to successions of blows, numbering in most cases as many as 4000. The magnitudc of the blow, in each set of experiments being made, greater or smaller, as occasion required The general result obtained, was that when the blow was powerful enough to bend the bars, though one half of their ultimate deflection (that is to say, the deflection which corresponds to their fracture by dead pressure) no bar was able to stand 4000 of such blows in succession; but all the bars (when sound) resisted the effects of 4000 blows, each bending them through one third of their ultimate deflection.

Other cast iron bars, of similar dimensions, were subjected to the action of a revolving cam, driven by a steam engine. By this they were quietly depressed in the centre, and allowed to restore themselves, the process being continued to the extent, even in some cases, of an hundred thousand successive periodic depressions for each bar, and at a rate of about four per minute. Another contrivance was tried, by which the whole bar was also, during the depression, thrown into a violent tremor. The results of these experiments were, that when the depression was equal to one-third of the ultimate deflection, the bars were not weakened. This was ascertained by breaking them, in the usual manner, with stationary loads in the centre. When, however, the depressions produced by the machine were made equal to one-half of the ultimate deflection, the bars were actually broken by less than nine hundred depressions. This result corresponds with and confirms the former.

By other machinery, a weight equal to half of the breaking weight, was slowly and continually dragged backwards and forwards from one end to the other of a bar of similar dimensions to the above. A sound bar was not apparently weakened by ninety-six thousand transits of the weight.

It may, on the whole, therefore be said, that as far as the effects of reiterated flexure are concerned, cast iron beams should be so proportioned, as scarcely to suffer a deflection of one-third of their ultimate deflection. And, as it will presently appear, that the deflection produced by a given load, if laid on the beam at rest, is liable to be considerably increased by the effect of percussion, as well as by motion imparted to the load, it follows, that to allow the greatest load to be one-sixth of the breaking weight, is hardly a sufficient limit for safety, even upon the supposition that the beam is perfectly sound.

In wrought iron bars, no very perceptible effect was produced by 10,000 successive deflections by means of a revolving cam, each deflection being due to half the weight, which, when applied statistically, produced a large permanent flexure.

(No. 2.)

RAILWAY TELEGRAPH SYSTEM;

For facilitating business and protecting life and property along railroads.

Concerning a subject which is now exciting special attention from sundry influential journals in various sections of the union, namely, the *safety of railroad passengers*—a few observations, in reply to questions frequently asked, may not be deemed intrusive, from a former member of the press, whose pursuits, for several years, have incidentally, (if not necessarily) turned his attention to the question under consideration—a question which has equal interest for every human being among the millions annually traversing the vast lines of railroads throughout the United States.

1. The necessity for increased *safety* in conjunction with the increased *speed* in railroad travelling, as well as the general convenience of transacting business among *employees* along railroad routes, should turn public attention promptly and strongly upon the vast importance of *telegraphic facilities* in connection with *railroad operations*. Precautions for protecting life and property should certainly keep pace with the increased ratio of railroad velocity now universally required by the travelling world. Lightning may be rendered an invaluable auxiliary for steam in this important connection.

2. Though "*railway telegraphing* is attempted to a very limited extent, even the partial experiment on one of the most profitable railroads in America, (though that experiment employed little of the *organized system* here proposed,) will probably fully sustain the assertion, which I hazarded when commencing the establishment of the telegraph system by individual enterprise seven years ago, "that a *well-arranged* telegraph for *railroad purposes*, would, each and every year, render to a railroad company sufficient benefits to counterbalance the whole cost of construction."

3. The power of instantaneously regulating the business of even the longest railroad, by conferring on its managers almost ubiquitous powers—the facility for transmitting and receiving orders and intelligence, calculated to promote harmonious connections of trains at every station along the route, and thus measurably to prevent, not merely *delays*, but *accidents*, that might prove seriously disastrous to property, and dangerous to life and limb, (which facility of communication might be exercised by any conductor or engineer of a railroad train while stopping even two or three minutes and connecting with the wires *at any point* along the route); this vastly important power cannot be adequately estimated even in view of the severe penalties which an overwhelming *public sentiment* is enforcing more and more strongly against railroad companies in the shape of "damages" to persons injured by accidents—which accidents, though often seemingly beyond their present means of prevention, still further afflict those companies in the crash of shattered trains and injured reputation, with consequent diminution of dividends and depreciation of stock.

4. With a *rightly-arranged* "railway telegraph system," in full operation, there is not a man *fit* for the responsible duties of engineer or conductor—not a clerk, overseer or "station-man" worthy of employment on any railroad—not a man qualified for such railroad duties, (and upon whose faithful discharge of duty depends so much of life and property, as well as the character and value of the railway itself,) who could not be instructed quickly to make telegraphic signals, *from any point*, and at any hour of night or day, which would alarm and inform *any* or *all* stations along the whole extent of the line, about any delays, accidents, or other matters essential to the safety of passengers and property. Indeed, not only every "station" or office, but every *train* while actually under swiftest headway may, ere long, be "alarmed" and "cautioned," whenever necessary, by ringing bells or displaying signals along some of the posts between the "stations," to warn engineers and conductors about *any* difficulty or irregularity which might produce accident along the track.

5. Though the system has *not* yet been carried out to *this* extent on any railroad, IT CAN BE DONE: And when it becomes

generally known that it *can* be done, and done promptly, efficiently and economically, *public sentiment* will powerfully combine with a *sense of self-interest in railroad companies* to require that *it shall be done*; and done, too, in a manner *most effectual* for protecting life, limb and property, against the increased dangers consequent on the increased and still increasing average velocity in railroad traveling.

6. A review of circumstances connected with delays and accidents upon railroads generally, warrants me in expressing a belief that, by the adoption of this system, a large portion, a very large portion, of those difficulties might have been avoided, much time, expense and reputation saved, many lives and much property rescued from destruction. As these various objects *can* be measurably accomplished, it remains to be seen how far and how fast the railroad companies will avail themselves of the advantage; and also how far the public and the courts will hold any company blameless that fails to adopt measures for preventing the recurrence of calamities which occasionally happen for want of such *well-arranged* telegraph facilities along even the best-conducted railroads.

7. Without dwelling on other advantages that may suggest themselves to persons who fully reflect on the subject, I will only add the remark that any railroad which *fully* employs such *well-organised* auxiliaries for promoting the comfort and safety of passengers, (which, as before stated, can be done economically as well as efficiently,) will speedily find its advantage, not merely in the diminished liability to accidents, but in the increased confidence and patronage of the whole community. I do *not* dwell upon the probability that the several State Legislatures will ere long *compel* railroad companies to adopt such precautionary measures; for the principle of *self-interest* alone, if no other principle influences corporations, (and railroad companies have certainly manifested strong desires for adopting all practicable improvements suggested by a spirit of humanity,) will cause the speedy

adoption of the "*Railway Telegraph System*" as being calculated essentially to protect life and property amid the increasing dangers to which they are exposed by the increasing velocity of railway traveling in these days of steam and lightning.

HENRY O'RIELLY.

New-York July, 1852.

(No 3.)

Extract from the Report of Capt. Simmons to the Railway Department of Great Britain, June, 1852.

It appears advisable, in considering this question, that some few observations should be made upon a proposition which is considered by many as holding out a prospect of obtaining a greater degree of safety upon railways, viz: to prescribe an interval of time to be observed upon all railways between succeeding trains, and which should at all times be strictly enforced.

This proposition, as has been stated above, has been adopted on some railways, but for the reasons there given does not appear alone to afford a sufficient security for the safe working of a railway. There are other reasons why any rule as to this interval could not be generally applied. The object to be gained in fixing an interval of time between trains following each other upon the same line of rails is, that upon an accident occurring by which the stoppage of a train is occasioned, and the line of railway obstructed, there shall be sufficient time to admit of a signal being sent out to protect the rear of the train that is stopped. This time must depend on the nature of the signal. In fine weather a light or a flag is employed, according as the necessity for its use may arise, by night or by day, which may be seen for a considerable distance, provided the view be unobstructed either by curves or objects in the vicinity of the railway. In foggy or thick weather, a detonating signal is attached to the rail, which, upon being exploded by the passage of an engine, gives a loud report, and thus communicates the required signal to the driver.

This latter signal requires that the man whose duty it is to fix it, should actually have arrived at the place where the signal first becomes available, and is therefore, the most unfavorable condition under which signals can be applied.

Upon the people in charge of a train receiving a signal to stop, it is their duty to apply the means provided upon the train for arresting its progress, with the greatest alacrity. The distance to be traversed by the train before it will come to rest, will depend, first, upon the alacrity with which the means are applied, and secondly, upon the extent of these means, as compared with the weight and speed of the train, taking also into consideration the inclinations and curves upon the line, and the condition of the weather.

The distance, therefore, from any obstacle at which a signal must be given in order to secure the safety of the triffic, requires to be ascertained with reference to each railway, and the weight of engines and trains in general use upon it, the speed at which they travel, and the means for arresting their progress provided upon each train.

The interval between succeeding trains should be made up therefore,

1 Of the time consumed in stopping the first trains.

2 Of the time consumed by the guard, or man who is responsible for applying the signals, in going out to the required distance with those signals. This time, in a case in which considerations of public safety are involved, should be determined under the most unfavorable conditions in which the signals can require to be applied, such as a dense fog.

A liberal margin should, moreover, be allowed in each consideration in the interval so calculated, which will seldom be less than 10 minutes, and may be more. Upon railways, where the means provided for arresting the progress of a train are very powerful, it might be reduced.

Few companies adopt a less interval than 10 minutes; all, however, have rules by which it is imperative upon their servants to exhibit at all signal stations, the "danger," or "stop" signal, for a certain interval after the passing of every train, so as to prevent at each of these points, which average a distance of not more than three miles apart on all the railways in the Kingdom, a diminution in the interval, considered necessary by the managers of the railways, to be maintained between the trains.

In any regulations of this nature, as in all others that may be adopted, safety would still depend upon the vigilance of the servants of the companies, and the efficiency of the machinery.

From these considerations, it appears manifest, that to prescribe a certain fixed interval of time applicable alike to all trains, taking the responsibility out of the hands of the companies, would be improper, as each line, with its gradients and curves, and the train arrangements in force upon it, would require separate consideration. To enforce upon all companies an uniform regulation in this respect would, moreover, be unjust, for upon a line of light traffic, where trains do not succeed each other with great rapidity, fewer servants may be employed upon the trains, and fewer breaks used for stopping the trains, a longer interval of time being adopted; whereas upon a line of heavy traffic, railway companies may find it in their interest occasionally to station men within signalling distance along the line of railway, in order to save the time consumed by a guard in running out with and placing his signal, when his train shall, from any cause, have been obliged to stop.

The prescription of a minimum interval, as deduced from a line of great traffic, would tend to diminish rather than increase safety in traveling, as it might lead those companies which do not use the precautions employed upon the line of great traffic, to adopt the minimum interval, without examination of the data and details upon which it was founded, and so relieve them, in a great degree, of that responsibility which should attach to them.

(No. 4.)

Report of Captain Laffan, to the Railway Commissioners of Great Britain:

It is evident, that the proportion which should exist between the breaking power, and the total weight of the trains, must depend upon the speed at which those trains usually run, and upon the distances within which the company's regulations require, that they should always be able to stop, on receiving intimation of danger.

The London and North-Western Company's printed regulations direct:

(Rule 11, page 62.) That on the arrival of a train, at a station, the red signal shall be shown, and continued for five minutes after its departure.

(Rule 23, page 19.) That there shall be an interval of not less than five minutes, between any two trains descending the Newton incline, towards Warrington.

(Rule 2, page 26.) That in foggy weather, fog signals shall be placed on the rails, for 600 yards behind any train that has come to a stand.

(Rule 2, page 17.) That engines travelling on the same line shall keep 800 yards, at least, apart from each other.

From these rules, I draw the conclusion, that the company's officers consider five minutes a sufficient interval of time, to allow at stations, between trains travelling upon the same line; that they consider 800 yards a sufficient interval of distance between such trains at intermediate points; and that they are of opinion that 600 yards give sufficient space to enable any train to stop, on perceiving a danger signal.

In order to form an opinion as to the sufficiency of these intervals of time, and of distance, it is necessary to ascertain,

1. The weight of ordinary goods and passenger trains, upon the London and North-Western line.

2. The usual speed of such trains.

3. The amount of breaking power usually placed at the disposal of the parties in charge of the trains. And

4. The intervals both of time, and of distance, within which such trains can be stopped.

The rules of the London and North-Western Company direct, that goods trains shall not consist of more than 40 loaded wagons; and they provide that one brake-van shall be attached to each goods train. The time-bills, for goods trains, show that they run at the rate of 25 miles an hour. A goods train, I therefore take to be composed as follows:

	TONS.
Engine weighs,	18
Tender,	10
One brake-van,	3½
Forty loaded wagons,	240
Total weighed,	271½

Speed 36⅔ feet per second.

	TONS.
Weight upon four driving wheels,	12
All wheels locked by brakes,	10
Ditto do. do.	

An ordinary passenger train, I assume, to be composed of an engine and tender, two brake-vans, and 14 carriages; and for the speed, I take the not unusual rate of 45 miles an hour. Such a train would be composed as follows:

	TONS.
Engine weighs,	18
Tender,	10
Two vans,	9
Fourteen carriages,	70
Total weight,	107

Speed, 66 feet per second.

	Tons.
Weight on driving wheels,	9
All wheels locked,	10
Do. do.	9
Total weight on the wheels that are locked or retarded,	28

There remains to see within what intervals, both of time and of distance, the trains above described can be stopped, when traveling at their usual speeds of 25 and 45 miles an hour.

In order to determine this question, I have made some experiments, which, though not so extensive as I would wish, appear to me to be sufficient for the present purpose. The results I give with considerable confidence, for, both in making the experiments, and in the subsequent comparisons and calculations for reducing them, I had the great advantage of being most kindly assisted by my valued friend and instructor, Professor Barlow, to whose well-known experience and skill, I beg to acknowledge my obligations.

The object of the experiments was to ascertain, first, the amount of retardation due to axle-friction, and other ordinary causes of resistance to the movements of trains; and next, the value to be ascribed to the action of the various breaks, and to the retarded movement of the engine when the gearing was reversed.

The experiments were made with a train composed of an engine and tender, 19 loaded wagons, 1 first class carriage, and 2 break-vans, running at speeds varying from 20 to 30 miles an hour, over a line perfectly level and straight. The formulæ deduced from such experiments, therefore, cannot be said strictly to apply to any other than trains similarly circumstanced; but, in the first place, the action of inclined plains is so well understood, that I feel no hesitation in adding to the formulæ for a level line, the expressions respecting the influence of adverse and favorable gradients; and, secondly, I am led to believe, from my own experience, that these formulæ, for speeds of between 20 and 30 miles an hour, will give a very near approximation when applied to the higher speeds of passenger trains.

The following are the formulæ resulting from these experiments:

Let R represent the retardation or destruction of velocity, estimated in feet per second, resulting from all causes, whether the ordinary resistances, or the action of a reversed engine, or of the various breaks:

V, the velocity, also estimated in feet per second, at which the train is running when the steam is shut off:

W, the whole weight of the train, engine and tender included:

w, that portion of the total weight of the train, which rests upon wheels that are locked by the action of the breaks, including the weight upon the driving wheels when the engine is reversed:

B, the base of the slope, (when on a gradient,) which gives a rise or fall of one foot:

G, the uniform accelerating or retarding force of gravity = 32·16 feet per second.

D, The distance within which the train can be stopped; and

T, The time consumed in stopping.

Then, upon a level line with steam shut off, and no breaks applied.

$$R=\left(\frac{W}{354}\right)\frac{G}{W}=\frac{G}{334}=\cdot 0963 \text{ feet per second.}$$

and when the breaking power is applied

$$R=\left(\frac{W}{334}+\frac{w}{7}\right)\frac{G}{W}=\cdot 0963\pm\frac{32\cdot 16}{B}$$

and upon an ascending or descending gradient, when the steam is shut off and no breaking power applied

$$R=\left(\frac{W}{334}+\frac{W}{B}\right)\frac{G}{W}=\cdot 0963\pm\frac{32\cdot 16}{B},$$

and when breaking power is applied

$$R=\left(\frac{W}{334}+\frac{w}{7}\pm\frac{W}{B}\right)\frac{G}{W}=0963+\frac{4\cdot 094w}{W}\pm\frac{32\cdot 16}{B},$$

using the expression + on an ascending, and — on a descending gradient. And in all cases

$$D=10\,V+\frac{V_2}{2R} \text{ and } T=10+\frac{V}{R},$$

assuming, as I do from experience, that 10 seconds are lost before the breaking power can be applied.

Applying these formulœ to the trains previously described, we have for the goods train,

$W=271\frac{1}{2}$ tons;
$w=25\frac{1}{2}$ tons;
$V=36\cdot666$ feet per second.

Then upon a level line,

$$R={\cdot}0963+\frac{4\cdot594+25\cdot5}{271\cdot5}={\cdot}5278 \text{ feet per second;}$$

and a gradient descending 1 in 150,

$$R=0963+\frac{4\cdot594+25\cdot5}{271\cdot5}-\frac{32\cdot16}{150}={\cdot}3144 \text{ ft. per second;}$$

and on the level line

$$D=10=36.966+\frac{36\cdot666^2}{5278+2}=1640 \text{ feet, or } 546\tfrac{2}{3} \text{ yards.}$$

$$\text{and } T=10+\frac{V}{R}=10+\frac{36\cdot666}{{\cdot}5278}=79\cdot47 \text{ seconds;}$$

end on a gradient descending 1 in 150,

$$D=10+36\cdot666+\frac{36\cdot666^2}{{\cdot}3134+2}=2{,}511 \text{ feet, or } 837 \text{ yards,}$$

$$\text{and } T=10+\frac{36\cdot666}{{\cdot}3134}127 \text{ seconds.}$$

Next, for the passenger train, we have

$$\left.\begin{array}{l} W=107\\ w=28\\ V=66\end{array}\right\}\begin{array}{l} \text{then } R={\cdot}0963+\frac{4\cdot594+28}{107}=1.2985 \text{ ft. per second;}\\ \text{and } D=10+66+\frac{62^2}{1\cdot2985+2}=2337 \text{ ft., or } 779 \text{ yards;}\\ \text{and } T=10+\frac{66}{1\cdot2985}=60\cdot8 \text{ sec., upon a level line.}\end{array}$$

and upon a gradient descending 1 in 150, we find,

$$R=1\cdot2985-\frac{32\cdot16}{150}=1\cdot0841 \text{ feet per second;}$$

$$\text{and } D=10+66+\frac{66^2}{1\cdot0851+2}=2669 \text{ feet, or } 889\tfrac{2}{3} \text{ yards;}$$

$$\text{and } T=10+\frac{66}{0841.}=70\cdot8 \text{ seconds.}$$

From this, it appears that an ordinary goods train, proceeding at its usual speed of 25 miles an hour, requires a distance of

546⅓ yards and 79·47 seconds of time, to enable it to come to a stand upon a level line, and that the distance is increased to 837 yards, and the time to 127 seconds, upon a gradient descending 1 in 150. It also appears that an ordinary passenger train, travelling at the not unusual speed of 45 miles an hour, requires 779 yards and 60·8 seconds, upon a level line, and 889⅔ yards and 70·8 seconds upon the descent of 1 in 150.

To provide, then, for the safety of public traffic, it appears that the distance (600 yards) to which danger-signals are directed to be sent back, should be considerably increased, unless it be thought more expedient to augment the breaking power attached to the trains.

On applying the conclusions arrived at from the preceding experiments, to the circumstances of a goods train travelling at the rate of 25 miles an hour, and requiring to stop, when followed upon the same line by a passenger train travelling at the rate of 45 miles an hour, it will be seen, that in foggy weather, in order to provide a sufficient security against the chances of a collision, it would be necessary, with the present breaking power, that upon a level line, the passenger train should be at least 7⅓ minutes in point of time, or 5½ miles in distance behind the goods train; and that, upon a gradient descending 1 in 150, those intervals should be increased to 8 minutes and 52 seconds of time, and nearly 6¾ miles in distance.

It will also be seen, that in fine weather, when we may suppose that the signal might be observed 300 yards off, the intervals between the same trains should not be less than 4⅓ minutes, or 3½ miles, upon a level line, and 5 minutes and 43 seconds, or 4⅔ miles upon a gradient descending 1 in 150.

If the above, then, be the intervals which should exist between a passenger and a goods train, upon all parts of the line whereon such trains run at the speeds described, it appears evident, that the intervals at which such trains are allowed to pass intermediate stations, should be considerably greater, to allow for the faster gaining upon the slower train.

(No. 15.)

New-York Railroads.—Accidents and Injuries, 1852.

RAILROADS.	Jumping on and off trains while in motion.				Fell, or were thrown from the trains while in motion.				Collisions of trains.			
	Employees.		Passengers.		Employees.		Passengers.		Employees.		Passengers.	
	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.
Albany and Schenectady,												
Buffalo and Niagara Falls,	1											
Buffalo and Rochester,			1	1			1			2		1
Hudson River,			1	1			2	1				33
Hudson and Berkshire,	1		others.									
Long Island,	1		2	1	1							
New-York and Erie,	1	2	5	2	3	3			3	4	6	5
New-York and Harlem,												
New-York and New-Haven,			1		4			2	2			
Northern,					1		1		1			
Oswego and Syracuse,												
Rensselaer and Saratoga,												
Rochester and Syracuse,					1	1						
Schenectady and Troy,												
Syracuse and Utica,			3		1	1		1				
Utica and Schenectady,					2							
Watertown and Rome,					1							

Buffalo, Corning, and New-York,	....	....	....	....	....	....	....	....	....	....	....	....
Buffalo and State Line,	....	....	1	....	....	....	....	....	....	....	....	....
Canandaigua and Elmira,	1	....	....	....	....	....	....	....	....	....	....	....
Rochester, Lockport, and Niagara Falls,	....	....	....	....	....	....	....	....	....	....	....	....
Totals,	5	2	14	5	14	5	4	4	6	6	6	39

No. 5.—(CONTINUED.)

RAILROADS.	Trains off the track.				Ran over while walking or standing on the track.				Collisions with carriages, &c., at road crossings.			
	Employees.		Passengers.		Employees.		Others.		Employees.		Others.	
	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.
Albany and Schenectady,							1					
Buffalo and Niagara Falls,												
Buffalo and Rochester,							9	3				
Hudson River,	2	2			3		17	1				
Hudson and Berkshire,												
Long Island,				1								
New-York and Erie,	4	2	4	2	3		10	2				
New-York and Harlem,												
New-York and New-Haven,	1				2	1	12	4			1	1
Northern,	1						2					
Oswego and Syracuse,												
Rensselaer and Saratoga,				several.								
Rochester and Syracuse,	1			several.			5				1	
Schenectady and Troy,							1					
Syracuse and Utica,							6					2
Utica and Schenectady,							2					
Watertown and Rome,												

Buffalo, Corning, and New-York,	....	....	....	....	....	....	....	....	....	....	....	....
Buffalo and State Line,	....	....	....	....	....	....	2	....	....	....	....	....
Canandaigua and Elmira,	....	....	....	....	....	....	....	1	....	....	....	....
Rochester, Lockport, and Niagara Falls,	1	....	....	1	....	....	1	....	....	....	....	....
Totals,	10	4	4	4	8	1	68	11			2	3

No. 5.—(Continued.)

RAILROADS.	At work on, or standing by trains.				Defective Machinery.				Other accidents.			
	Employees.		Others.		Employees.		Passengers.		Employees.		Passengers.	
	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured.	Kill'd.	Injured	Kill'd.	Injured.
Albany and Schenectady,	....	....	....	....	....	....	....	....	....	....	....	....
Buffalo and Niagara Falls,	....	....	....	....	....	....	....	....	....	....	....	....
Buffalo and Rochester,	3	....	....	....	....	....	....	....	....	....	....	1
Hudson River,	....	1	....	1	....	....	....	....	1	....	....	....
Hudson and Berkshire,	....	....	....	....	....	....	....	....	....	....	....	....
Long Island,	....	....	....	....	....	....	....	....	....	....	....	....
New-York and Erie,	2	6	....	....	3	1	....	....	....	....	....	....
New-York and Harlem,	....	....	....	....	....	....	....	....	....	....	....	....
New-York and New-Haven,	1	....	....	....	....	....	....	....	....	....	....	....
Northern,	....	....	....	....	....	....	....	....	....	....	....	....
Oswego and Syracuse,	....	....	1	....	....	....	....	2	....	....	....	....
Rensselaer and Saratoga,	1	2	....	....	....	....	....	....	....	....	....	....
Rochester and Syracuse,	1	....	....	....	....	....	....	....	....	....	....	1
Schenectady and Troy,	....	....	....	....	....	....	....	....	....	....	....	....
*Syracuse and Utica,	1	....	....	....	....	....	....	....	....	....	....	....
Utica and Schenectady,	....	....	....	....	....	....	....	....	....	....	others.	....
Watertown and Rome,	1	1	....	....	....	....	....	....	....	....	3	1

Buffalo, Corning, and New-York,	....	....	....	....	....	....	....	....	1	....	....	....
Buffalo and State Line,	....	....	....	....	....	....	....	....	....	....	....	....
Canandaigua and Elmira,	....	....	....	....	....	....	....	....	....	....	....	....
Rochester, Lockport, and Niagara Falls,	....	....	....	....	....	....	....	....	....	....	....	....
Totals,	10	10	1	1	3	1		2	2		3	3

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* 1 passenger killed standing on the platforms.

(No. 6.)

Comparative statement showing the number and description of persons killed or injured on all the railways open for traffic in the United Kingdom, during the years 1849, 1850, and 1851.

DESCRIPTION OF PERSONS.	1849		1850.		1851.	
	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
Passengers killed or injured from causes beyond their own control,....	5	84	12	171	19	355
Persons killed or injured owing to their own misconduct or want of caution,..	18	12	20	12	17	20
Total passengers killed or injured,..............................	23	96	32	183	36	375
Servants of companies or contractors killed or injured from causes beyond their own control,..	14	12	65	42	64	27
Servants of companies or contractors killed or injured owing to their own misconduct or want of caution,..........................	113	67	63	21	53	21
Trespassers and other persons, neither passengers nor servants of the company, or contractors, killed or injured by crossing or walking on the railway,..	43	11	52	10	61	14
A child killed, and another injured, in consequence of an engine getting off the rails and running into an adjoining house,................	1	1	......	......	......	......
Suicide,..	3	......	4	......	4	......
	202	187	216	256	218	437
Total number of passengers carried in the cars,................	60,398,159.		66,840,175.		78,969,623.	

(No. 7.)

TABLE

Of accidents for a series of years on the railroads of the states of New-York and Massachusetts, and these of Great Britain.

	New-York railroads, 1850, 1851, and 1852.						Massachusetts railroads, five years, 1847 to 1851, inclusive.						British railways for the year 1849.					
	Employees.		Passengers.		Others.		Employees.		Passengers.		Others.		Employees.		Passengers.		Others.	
	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.	Kill'd.	Inj'd.
Jumping off or upon the cars while in motion,	12	4	25	15	2	..	3	7	15	19	..	..	12	9	10	9	..	..
Falling, or being thrown from the train,	33	11	12	4	..	..	28	52	3	16	..	..	31	20	5	..	..	..
Collision of trains,	8	9	9	46	..	..	20	8	53	9	..	..	7	7	..	66	..	..
Thrusting the head or arms out of the windows,	..	..	..	1	..	..	1	..	4	..	..	..	1	..	..	..	..	..
Standing on the platforms of the cars,	..	..	2	1	..	..	..	..	2	5	..	..	..	..	..	..	..	..
Run over while walking or standing on the track,	18	1	..	..	130	21	4	2	..	..	26	100	55	9	..	..	51	6
Collisions at road crossings,	..	..	..	..	9	8	..	..	..	..	21	20	..	..	..	..	1	4
At work on or standing by trains,	16	15	..	..	1	1	13	17	..	..	1	2	12	24	..	..	..	..
Defective machinery,	5	2	2	4	..	..	4	8	7	9	..	..	1	3	..	3	..	..
Other accidents,	2	..	3	4	..	..	5	8	..	..	2	1	3	4	..	2	..	..
Trains off track,	16	9	8	6	..	..	..	..	..	..	..	..	8	4	6	16	..	..
	110	51	61	81	142	30	78	102	84	58	50	123	130	80	21	96	52	10

(No. 8.)

Extract from the ordinance, regulating the police of railroads in France, made in 1845.

No person shall be allowed to enter the cars without having first purchased his ticket, or enter a class of cars different from that indicated by his ticket.

All tickets to be delivered on arriving at the station indicated.

No person shall get upon or leave a car, except from the side corresponding with the exterior rail of the track.

Passengers shall not pass from one car to the other, nor stand up, or lean out of them. Passengers shall not pass out of the cars, except at stations, and when the motion of the train is completely arrested.

No smoking shall be allowed in any part of the train.

Art. 31. The entrance into the cars is prohibited to any person who,

1. Is intoxicated or dressed in a manner to soil the other inmates.

2. To any person carrying charged fire-arms, or packages which from their nature, size, or odour, may incommode or annoy the passengers.

Any persons carrying fire-arms, shall satisfy the police that the same are discharged before they shall be permitted upon the platform.

Art. 32. The police shall place all passengers refusing to be separated from their dogs, in a department of the train appropriated for that purpose, and see that their dogs are securely muffled.

Art. 33. The guards or the agents of the company, shall immediately remove any person, who shall be found upon the track, or on any premises belonging to the railroad where he has no right to be.

In case of resistance, the guard or other agents, sworn according to the provisions of the 51st article of the schedule, may require the assistance of the agents of the public administration.

ART. 34. There shall be kept in every railroad station, a register signed at Paris by the prefect, and elsewhere by the mayor of the place, designed to receive the complaints of the passengers who have any charges to make against the guards, or other employees of the company; such register shall be presented upon the request of any passengers.

ART. 35. Prosecutions, in consequence of any accidents which occur from the acts of the agents of the company, shall be directed against the superintendent.

ART. 36. Whenever an accident shall occur upon a railroad, it shall be made known to the local authorities, as soon as possible, by all the employees who witnessed the same.

ART. 37. A certified printed copy of the rates of fare, shall be kept affixed in some conspicuous place in the offices of the company.

Conductors and brakemen shall be furnished with copies, to be by them exhibited whenever demanded.

The regulations, to be observed by passengers, shall be posted up in each car.

ART. 39. The superintendent and guard shall wear a uniform, and carry a sabre for their protection.

ART. 40. The supervision to be exercised by the administration, for the execution of these regulations, shall be provided,

1. By the deputy engineers of roads and bridges.
2. By the special commissaries of police for railroads, for Paris and Saint-Germain.
3. By three other special commissaries resident, one at Montes, the second at Vernon, and the third at Rouen; and by five agents of supervision, placed under the orders of the commissaries. These agents shall be put under oath.

Art. 40. These commissaries of police, and the agents of supervision, shall certify to all infractions committed, whether by the employees of the company, or by other persons; also to all the accidents that may occur.

They shall make their certificate to the prefects, who shall transmit a copy to the minister of public works: having made himself sure of the circumstances of the affair, if occasion requires, by the engineers of roads and bridges.

Art. 41. In each locality, the chief of service shall obey the requisitions of the commissaries of police, and the agents of supervision under their orders, in all that relates to the execution of the regulations.

Art. 42. The commissaries of police, and agents of supervision, shall certify to all infractions, and shall immediately give notice of them to the engineers of roads and bridges, charged with the supervision, and to the directors of the company.

Art. 43. All expenses arising from the execution of these regulations, shall be paid by the company.

The company is bound to furnish local accommodations for the commissaries of police, and for the agents of supervision.

If circumstances render it necessary to establish military posts near the stations, all the expenses resulting therefom shall be a charge upon the company.

Art. 44. All infractions of the regulations, shall be prosecuted, and repressed according to the laws and ordinances.

(No. 9 & 10.)

[From the American Railroad Journal, February 15, 1851.]

ACCIDENTS ON RAILROADS.

We can hardly look into an exchange paper, of late, without meeting an account of some dreadful accident on railroads. These have become so alarmingly frequent, as to create uneasiness on the part of travellers for their own safety, and is a source of great expense to companies, not only in repairs, but in the still greater one, of paying for mangled limbs, and for life destroyed. Certainly, something should be done to prevent this crying evil.

It generally turns out that "no one is to blame" in the accidents. They are attributable to some cause, that no person could have foreseen, or to some latent defect, which only shows itself after the disaster occurs. As far as immediate responsibility on the part of persons employed is concerned, this may be true. Take the case of the late accident on the Erie railroad. This was caused by the breaking of a rail, owing to the poor quality of its iron, for no good rail will break short off, without showing indications of this beforehand. The accident probably occurred at a curve of the road, and the fitting the rail to this, very likely, was the primary cause of the fracture. At any rate, a bad rail was used. The whole lot, of which this was a part, might have been bad, or this might have been an exception. If so, the exception may again happen at some other dangerous points, and the unlucky traveller may again be pitched down a precipice, at the imminent risk of life and limb.

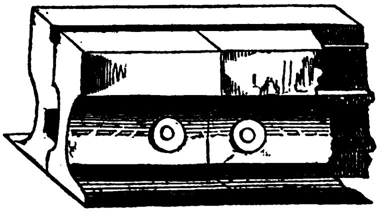
The great question is, how shall these accidents be prevented? Is there any difficulty in this? for, if so, our railroads will begin to be looked upon as very dangerous modes of travelling. There can be no question, but these accidents may be placed almost beyond the bound of possibility, by proper care, and by the use of suitable material, both in the rail and the rolling stock.

It is notorious, that at present low price of rails, a great many of our roads are laid with a very poor iron, entirely unsuitable for its purpose, both as regards true economy and safety. Where roads are built upon contract, the contractor puts down the cheapest article he can get. His connection with the road is over as soon as he can get the work accepted. Roads are thus very often put in operation, when the lives of the passengers are jeopardized every time that a train passes over them. Where the company purchase their own iron, the result is often the same. Most of them, for the want of sufficient means, or a proper idea of the importance of a liberal expenditure in the outset, or from mistaken ambition of having the reputation of building the cheapest road going, act upon the false principle of economy, of using what cost the least, without any regard to quality. Such are facts too notorious to require proofs. In the end, a succession of accidents, the legitimate result of this kind of economy, will force a company into the proper steps to remedy them, to relay the track, or buy new furniture, and throw away the old. The cost of a road, in this way, is about double, nearly one-half of which might have been saved, by using the proper materials in the first instance.

How shall this evil be remedied? shall it be left to work its own cure, by a process which shall half destroy the life of the patient? or shall it become the subject of legal interposition? We think it should, though we are generally opposed to legislative interference with the operations of companies. As things are now, directors cannot be brought to a proper sense of their duties. They have not the courage, frequently, to act according to their convictions, to withstand the desire of having the reputation of buying low, to gain an eclat in the community, or some supposed advantage over other roads. Nothing is more common, than the remark, "I should like to purchase a good article; I think it would be economy, in the long run, but we must husband our means and buy where we can buy cheapest. If we give high price, we cannot build our road." This is the argument used. The cheapest article is often bought, for no other reason, but its cheapness. The consequence is, that it comes to repair as soon as it is used, and the company soon finds itself compelled, by the constant annoyance of accidents, and the cost of repairs, to throw away the cheap for the economical.

While, as a general rule, companies should be left in the management of their affairs to the guidance of their own ideas of economy or prudence, the community should, in its collective capacity, see that certain conditions, essential to personal safety, are followed in all cases. One of these conditions should be, that, on all dangerous curves, either upon an embankment, or of a short radius, an iron should be used of known and tested quality, about which there can be no mistake. If such an article had been used, the accident on the Erie railroad would have been prevented. So with iron bridges. What does the travelling public know about the safety of these structures? What do companies know about the quality of iron used? Nothing. All this is left to the contractor. His chief motive is to make all the money he can. The only inducement to the use of proper materials, is his own reputation.. The same is to a certain extent true of every article in use, both upon railroads and their equipment.

There has been recently invented a new rail, which, it strikes us, is exactly adapted for safety on curves, and should be used in all cases. We refer to the "compound rail," of which we gave some account in our paper of the 18th ult, and of which the following cut will give a good idea :



With a rail of this form, accidents from a misplacement or break of rail, which are now so common, would be almost impossible. This may be made a continuous rail for miles. If it is composed of good iron and properly put together, it is exactly adapted to resist the enormous centrifugal force produced by high speeds on short curves. With this, the curves can be made perfectly true. No immediate evil can happen from the loosening of a spike, the breaking of a chair, or the settling of cross ties. In the crossing of the bridges, such a rail would of itself sustain a train, even if the structure should give away. In many respects its use would be a vast saving. In principle, nothing can be more faulty than the form in common use, by which the line is made up of distinct pieces, and which require to be held in their places by chairs of great strength, and between which and the rails the concussion produced, not only destroys the rail, but for a similar reason, is the great cause of the wear and tear of machinery. The new rail is perfect in principle. It has proved to be equally so in practice, as far as it has been used, Is it not then the bounden duty of companies to turn their attention to this subject, and to adopt it, should further experience confirm the present evidence in its favor? If it is what it is believed to be, should not companies be required to use it in all places where accidents are likely to be attended with serious consequences?

[From the N. Y. Journal of Commerce, May 1st, 1852.]

ON RAILWAY AXLES AND WHEELS, AND CURVES UPON RAILWAYS.

Messrs. Editors:—The increasing importance which several of your recent correspondents have attached to the breaking of railway axles, is not without sufficient cause, although, we have not, in this country, as in Europe; a sufficiency of statistical information on the subject, to enable us to ascertain the amount of the evil. But that it is truly appalling, appears to be the unanimous belief even in England, the accidents caused by the breaking of axles and wheels amount to 18 per cent of the whole, according to Lardner's Railway Economy, page 322. The breaking of the axle, frequently arises from a deficiency of strength, caused by a want of homogeneousness in the manufactured iron. This is a defect which cannot with certainty be overcome, except by the process of melting, casting and forging; and hence, on the continent of Europe, where it would appear that the life of a subject is more considered than that of a citizen si here, cast steel axles, of very superior quality have very generally been adopted.

* * * * * * *

When iron axles have been long in use, the continuous vibration is said to produce crystalization of the iron, and ultimate fracture in consequence thereof. This appears to me (but with due deference I write it) a mere assumption; because, so far as I know of, it does not occur with cast steel of the proper quality; and next, because it is impossible to tell, a priori, whether or not iron is crystalline or fibrous in its structure at any part of it. The fairest assumption, therefore, should appear to be, that axles which, when broken, show a crystalline structure, were so when they came from the hands of the manufacturer, rather than that state was produced by ordinary use; or at least, that it should appear that all axles become crystalline by use; which has not yet been shown to be the case. * * * *

Another case of axles breaking, arises from the practice o raising the outer rail on the curves, instead of the inner one. It is difficult to imagine how such an erroneous principle ever obtained advocates. * * * * * * *

T. A. R.

(No. 11 & 12.)

[From the Report of the New-England Association of Railroad Superintendents, Jan. 1, 1850.]

REPORT ON PERSONS RIDING UPON LOCOMOTIVE ENGINES.

The committee to whom was referred the subject of allowing other persons than the engineman and fireman to ride on locomotives, have attended to that subject, and beg leave to report, that in their opinion, the practice is quite common, and evil in its tendencies, and unless some uniform plan is adopted to put a stop to the same, it will become universal, and the most serious consequences will result from it. * * * * * *

Those in the habit of riding on the engine to save their fares, and for other purposes, are generally inquisitive and loquacious, to such an extent, as to occupy entirely the time of either engineman or fireman in answering or listening; of course, the duty of one or the other of these men must be neglected for the time being; the whistle is not blown, and the bell is not rung at the places specified; some obstruction is not seen till it is too late to stop, and perhaps the whole train is thrown off the track, causing a great destruction of property and of life.

The latter is the most serious consequence, and is one, compared with which, the loss of property is but a small consideration.

There are sometimes accidents at level crossings, for which the railroad company should not be held responsible, inasmuch as they are the result of the carelessness of those who travel on common road; and yet, if through inattention, the fireman or engineman has neglected to ring the bell, the whole blame, and the whole damage, together with a large amount of public indignation, falls upon the railroad company. If inquiry be made as to the neglect of the engineman or fireman, it will often be found to have resulted from his attention having been occupied in listening to some story, or answering some inquiry of a passenger on the engine.

Minor accidents sometimes happen, and annoyances occur at stations, because the attention of the engineman is occupied in listening or talking to some one at his elbow on the engine. Among these accidents and annoyances may be enumerated, running off switches, when they are wrong, and the target not observed; running by the stations, and being obliged to back the train, to bring it into its right position; starting the train too suddenly, and moving on, in some instances for considerable dis tance, with a part only of the cars. These are not always the consequence of allowing persons to ride on the engine, but they are much more likely to occur under such circumstances, than when the engineman has nothing to distract his attention from the train.

The foregoing are a part only of the evils resulting from the practice of allowing persons to ride on engines; many others will readily suggest themselves to all who are familiar with the management of railroads. To remedy these evils requires concert of action among all the superintendents; and the committee, after due consideration, would recommend the adoption of the following rules:

No persons, excepting conductors and master machinists, while on their own road, shall be allowed to ride on the engine, unless by special permission of the superintendent, or some person to whom the superintendent shall delegate that authority. * * *

At the regular monthly meeting, held November 1st, 1848, after due consideration of this report, and a full discussion, it was

Voted, That we mutually recommend to each other, the rule that no one be allowed to ride upon locomotives attached to any train, with the engineman and fireman, unless it be the conductor or master machinist, so far as the said rule may be practicable.

[From the Report of the New-England Association of Railroad Superintendents, Jan. 1, 1850.]

REPORT OF COMMITTEE ON DISCHARGING EMPLOYEES, DEC. 20, 1848.

The committee who were appointed to consider what rules should govern railroad superintendents, in regard to the employment of persons who had left, or who had been discharged from other roads, have attended to the duty assigned them, and respectfully report:

The subject is one which has, doubtless, engaged the attention to some degree, of all railroad superintendents, and there are, probably, few roads in the vicinity of each other, or at least running in connection, but have found it necessary to adopt some mutual regulations in reference to it. Yet so far as the experience of your committee goes, this has ever been a delicate matter to arrange satisfactorily, since while it would be almost impossible on any road to maintain a wholesome discipline, if a person discharged for a grave offence, or a contumacious persistance in disobedience to a known order, could be allowed to enter at once into the service of another corporation, and, secure in his new position, encourage others to laugh at the idea of a discharge as a penalty for improper conduct; and while it would not only be injurious to the interests of railroad companies but even to the operatives themselves, that they should be encouraged to rove from one road to another, or even find facilities for changing employers, as often as fancy may dictate, or some slight dissatisfaction might arise; yet a stringent rule, prohibiting any railroad superintendent from employing a person who had been discharged from, or had improperly left another road, would hardly be policy for the employer, or justice to the employed. For it must not only be admitted, that even a railroad superintendent may sometimes err, and that a slight offence may sometimes meet with too severe a penalty; but moreover, it would seem hard, if not absolutely unjust, that because a person has committed some offence, for which a superintendent feels compelled (perhaps unwillingly, yet necessarily for the preservation of discipline), to discharge him, that he should be forever debarred from further employment on a New-England railroad, and thus, perhaps, in some cases, lose the years which he has spent in qualifying himself for the discharge of his accustomed duties. Besides, this stringent rule would often interfere with our own convenience. The number from which we would have to make a selection, in case of a vacancy, particularly for enginemen and mechanics, would be extremely limited, if we were to exclude all who had ever been discharged from any other road for any cause.

The idea suggests itself that the rule may be modified by allowing the discharged to be again employed, by obtaining the consent of his former employer. This, however, in the mind of your committee, is liable to objection.

In the first place, it leaves the fate of the operative in the hands of the superintendent, who has once decided against him. But a stronger reason is, that such consent would rarely be withheld, since a refusal would rather have the appearance of vindictiveness than of regard for discipline. What medium course, then, shall we adopt? Shall we classify offences? and determine what faults are, and what are not of sufficient importance to deserve entire exclusion from railroad employment? This may be done in some cases. There doubtless are faults of so grave a nature, so subversive of proper ordination, involving not only the hazard of the property of the corporation, but the imminent risk of the lives of passengers, as to deserve this severe sentence; but it is rather within the province of this association (or perhaps rather of the legislative enactment), than of your committee, to point them out. The course, then, which your committee are prepared, after mature reflection, to recommend, is this:

1. That, setting aside those cases which the association shall declare to be deserving of perpetual exclusion from railroad employment, superintendent, after being in possession of the circumstances under which the applicant for any situation has left his last place of service, shall be left at liberty to decide on the propriety of employing him.

2. That no person has ever been employed on any road in connection with this association, shall be received into the service of any other road so connected, unless he shall exhibit, from

the superintendent of the road on which he was last employed, a certificate setting forth the reasons of his leaving.

3. That every superintendent, on discharging, or otherwise dismissing any operative, shall furnish him such testimonials as in his opinion he shall be entitled to; and receiving any person from any other road, shall require such testimonials to be exhibited, and shall endorse on them the date, and nature of employment which he shall then furnish him; and in order to produce a uniformity in the customs of different superintendents, your committee further recommend, that their certificates be classified according to the respective merits of the persons who are entitled to them; and that blanks be printed by the association, and distributed to its various members for their use. The different grade of certificates might read as follows:

OFFICE OF RAILROAD, 184 .

1. This certifies that the bearer, Mr. , has been employed on this road, as for ending at date, and having discharged all the duties of his situation to my entire satisfaction, is entitled to an honorable dismission, as is recommended to the favorable consideration of any person who may have occasion for his services.

——————— *Sup't.*

OFFICE OF RAILROAD, 184 .

2. This certifies that the bearer, Mr. , has been employed on this road, as for ending at date, his conduct in that capacity has been unexceptionable, but having no further occasion for his services, he is entitled to and hereby receives an honorable dismission.

——————— *Sup't.*

OFFICE OF RAILROAD, 184 .

3. This certifies that the bearer, Mr. , has been employed on this road, as for ending at date, and is now discharged for the following reason, viz: "Leaving a station in advance of time, as stated in the time card."

——————— *Sup't.*

Modifications of the above certificates, will doubtless suggest themselves to the minds of members of the association. They are merely offered as the ground work of system, which your committee think may be introduced advantageously. It is not supposed, that any thing resembling certificate No. 3, would be very much in demand by persons who were discharged, until it came to be understood, that employment could not be obtained without it, and that even a poor certificate was better than none.

In conclusion, your committee are deeply impressed with the duty of all superintendents, who have occasion to discharge any one for fault (and especially an engineman or conductor, to whose care is committed the lives of passengers, or an agent who is entrusted with the funds of the company), to state fully the circumstances, which led to such discharge, as any suppression of any unfavorable fact, may not only endanger life and property, but be the means of again placing in temptation a person who had once yielded to its influences.

ton, S [illegible]

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